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DEPARTMENT OF THE ENVIRONMENT
ENVIRONMENTAL PROTECTION SERVICE
PACIFIC REGION

# FALSE CREEK BENTHIC SEDIMENT SURVEY
# 1982/83

Regional Program Report: 84-08

By

D.E. Brothers
D.L. Sullivan

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## ABSTRACT

British Columbia (B.C.) Place Ltd. applied under the Canadian Ocean Dumping Control Act (ODCA) to ocean dump sediments dredged from the floor of False Creek, Vancouver, British Columbia, as part of a foreshore improvement project. Industrial effluents and raw sanitary sewage have been discharged directly into False Creek since it had been dredged to navigation depth in the early 1900's. Benthic sediment chemistry from studies by Whiticar[1], Associated Engineering Services Limited[2], and Willis, Cunliffe and Tait[3,4] have shown that some areas of False Creek contain sediments with elevated concentrations of trace metals scheduled in the ODCA Regulations. In order to assess the acceptability of these benthic sediments for ocean disposal, Environment Canada, Administrator for the ODCA, jointly with B.C. Place officials designed a sediment chemistry study to spacially deliniate areas with sediments containing trace metal concentrations in excess of ODCA Regulated Limits. This report presents the results of this study.

## RÉSUMÉ

B.C. Place Ltd. a fait une demande en vertu de la Loi sur l'immersion de dichets en mer (LIDM) pour déverser dans l'océan des sédiments draqués du fond de False Creek, Vancouver, Colombie Britannique, dans le cadre d'un projet d'amélioration de la rive. Des effluents industriels et des eaux d'égout ont été dischargés directement dans False Creek depius le draguage effectué pour la navigation au début des années 1900. Dans des études faites par Whiticar[1], A.E.S.L.[2], et DelCan[3,4], la chimie de sédiments benthiques a montré que quelques zones de False Creek contiennent des sédiments dont les concentrations en niétaux à l'état de trace listés dans les règlements de la LIDM sont élevées.

Dans le but d'évaluer si le rejet dans l'océan de sédiments benthiques est acceptable, Environnement Canada, administrateur pour la LIDM, a préparé conjointement avec les officiels de B.C. Place une étude de la chimie des sédiments pour délemiter dans l'espace les zones dont les sédiments contiennent des concentrations de métaux à l'état de trace en excès des limites règlementées par la LIDM. Ce rapport preésente les résultats de cette étude.

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## SUMMARY

The analytical results presented indicate that all black reducing benthic sediments from the floor of False Creek contained sufficient concentrations of ODCA Scheduled substances to be considered unacceptable for disposal at the Point Grey Ocean Disposal Site. The underlying grey sediments were found to be "clean", and therefore acceptable for ocean disposal at Point Grey. From these observations, dredging was allowed to proceed for B.C. Place Ltd. in False Creek using color to determine which sediments could be dumped at the Point Grey Disposal Site, and which sediments would require special handling.

# 1. INTRODUCTION

The False Creek Environmental Committee (F.C.E.C.) was created on the recommendation of the Regional Ocean Dumping Advisory Committee (R.O.D.A.C.) to address environmental and human health concerns associated with the various development proposals in False Creek. The committee included representatives of the Environmental Protection Service, the B.C. Ministry of Environment, the City of Vancouver, B.C. Place and Expo' 86. It was agreed in a meeting of the F.C.E.C., October 1982 that a sediment chemistry study should be undertaken to define the distribution of trace metals and organics in False Creek. The results would assist in determining the most environmentally sound disposal options of spoils generated by future dredging operations.

The survey was designed jointly by Environmental Protection Service and B.C. Place Ltd.; the core samples were collected by Klohn Leonaff Consulting Engineers under contract to B.C. Place. Trace metal analyses were conducted by the Department of Environment/Department of Fisheries and Oceans Laboratory in West Vancouver; organic analyses were conducted by the B.C. Ministry of Environment Laboratory at the University of British Columbia.

The following report presents the results of this joint study.

## 1.1 False Creek History

A comprehensive summary of the background uses and activities in False Creek can be found in the "AESL False Creek Aquatic Improvement Study, Vol. I to B.C. Place (December 1981)", and a summary of all existing sediment quality data is presented in "Marine Environmental Investigation of the Imperial Group False Creek Site; Willis, Cunliff, and Tait, March 1982".

Industrial wastes and municipal wastewater discharges have resulted in elevated concentrations of trace metals in bottom sediments. The east basin sediments contain the highest levels of trace metals,

petroleum products, organic debris and possibly, chlorinated organics. As more than three million cubic metres of sediment were removed from the Creek starting in 1913, the contaminants now found in benthic sediments are assumed to have been deposited since that time.

Redevelopment on the south shore of False Creek in the 1970's, including residential units, marina construction, and Granville Island Commercial outlets, has restructured the original shoreline of False Creek and shifted emphasis from industrial to recreational activities. Similar development on the north shore is planned by B.C. Place. It was the intent of this study to provide a data base for future development proposals.

## 2. METHODS AND MATERIALS

Transect lines were located 100 metres apart over the entire False Creek water body (Figure 1). A core station was established at each transect intersection. One hundred fourteen stations were successfully sampled; two stations were not completed because of coarse sediments and logs.

### 2.1 Field Procedure

Sediments were collected with a WINK VIBRA CORER. The Wink Vibra Corer consists of a core tube driven by a sonic drill head which produces 12,000 vibrations per minute. The corer is designed to pass through all layers of unconsolidated sediments to refusal.

The core tube was fitted with plastic liners to maintain each core intact prior to subsampling. Upon retrieval, samples were decanted, cores (with liners) were plugged with stoppers, marked for identification and frozen. At stations where samples could not be attained by coring, surface sediments were collected with a Ponar Grab Sampler by EPS personnel.

### 2.2 Subsampling Procedures

Cores were subsampled to insure that discrete sections of black, grey and interface layers were collected. A physical description of each sample was noted on collection. A 10-15 cm sample was removed from each level (Figure 2). Each core was split length wise; one-half was removed and stored as archive material; the remainder was sub-divided for physical and chemical analysis. The outer one-quarter inch of each core, in contact with the core liner, was reserved for physical analysis. (Data was collected for structural information by Klohn Leonoff and is therefore not included in this data report.) The remaining sample was removed to an acid washed beaker, mixed with a teflon stirrer and subdivided for metal and organic analysis. Metal samples were stored in paper soil bags; organic

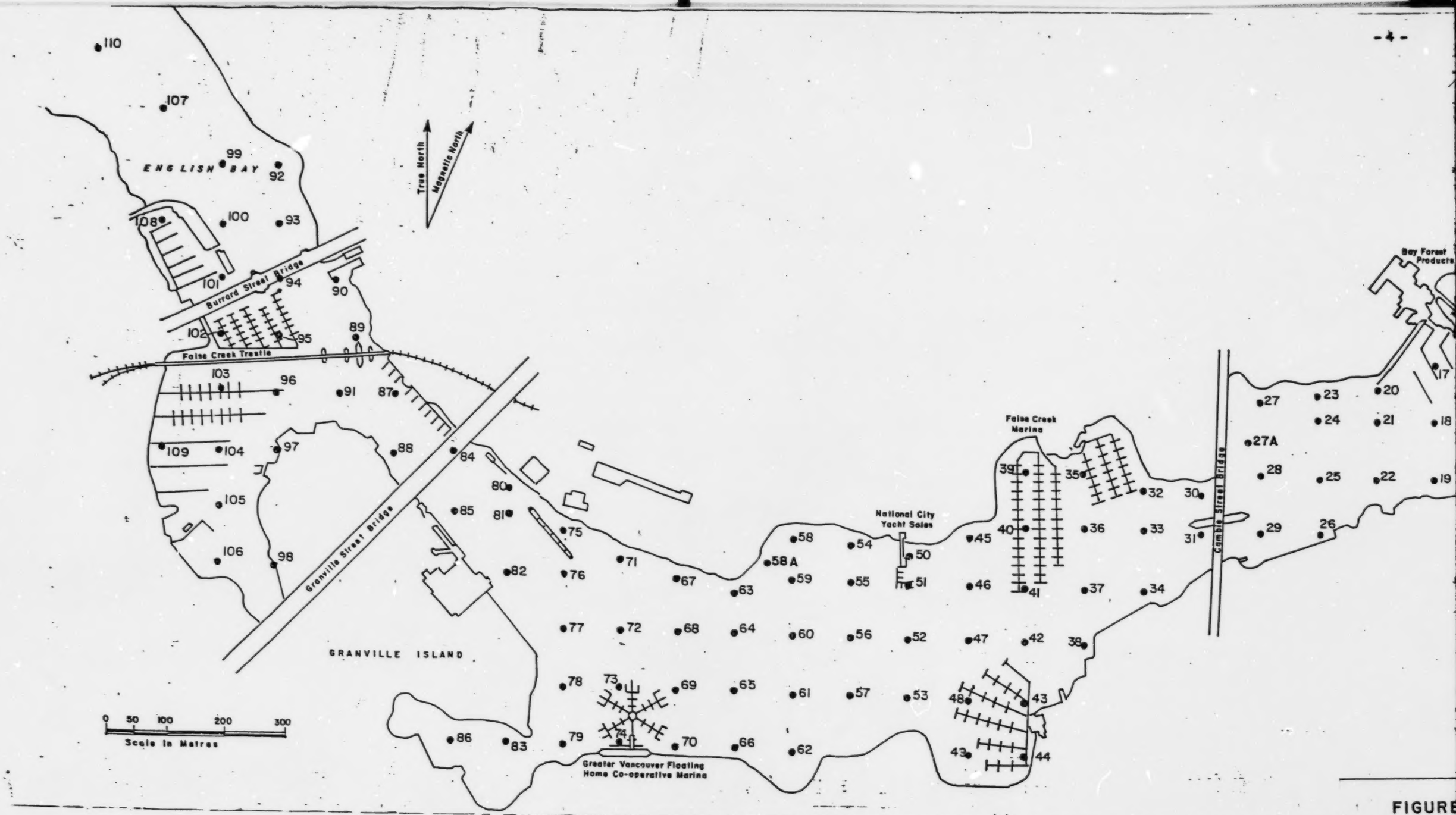



FIGURE
FALSE
STATI
Decem

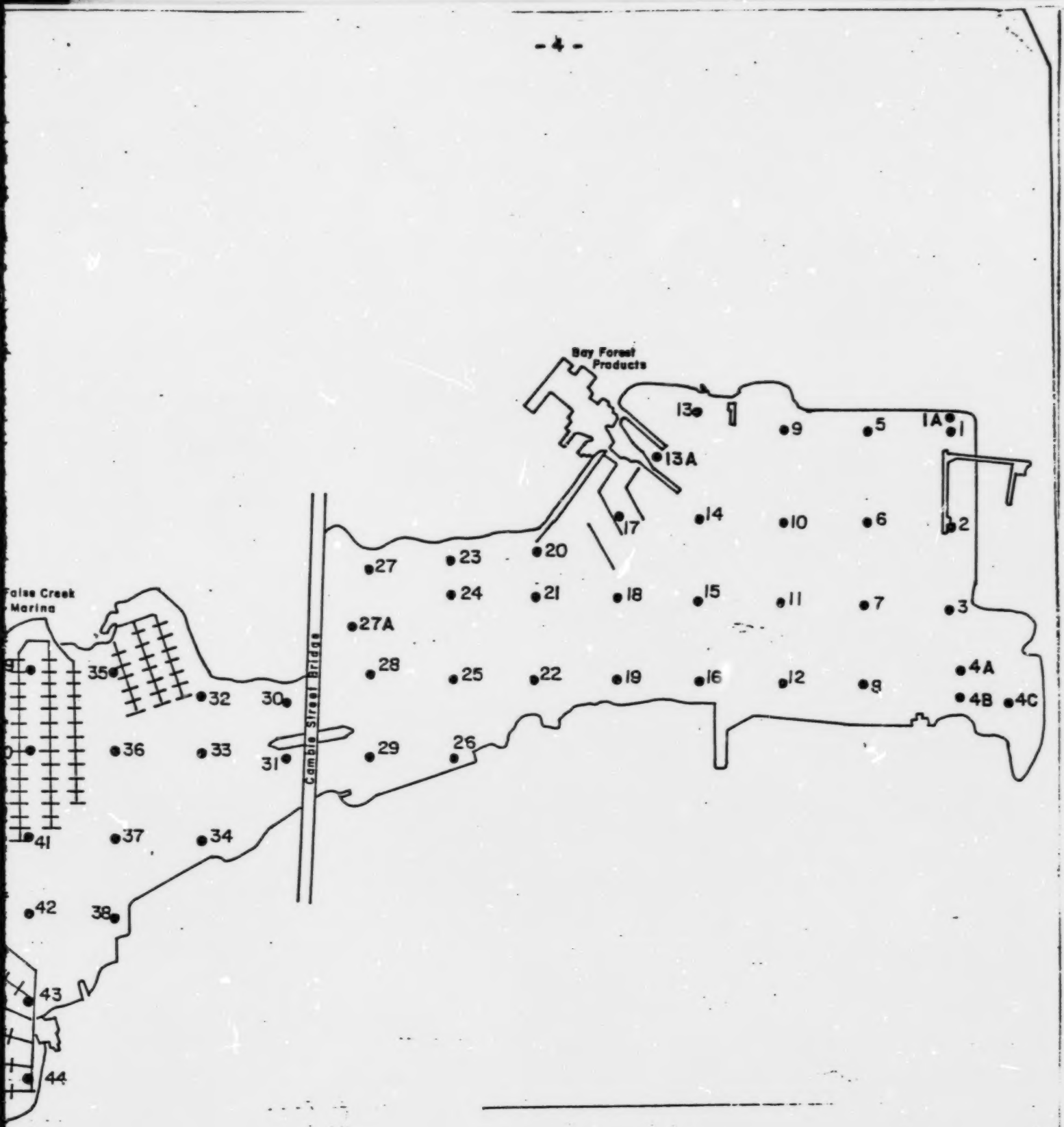
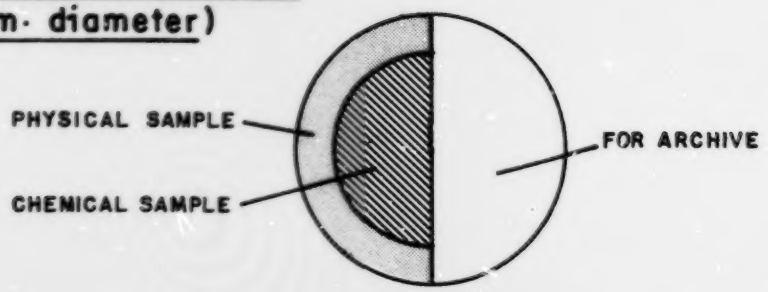



FIGURE 1
FALSE CREEK SEDIMENT STATIONS, November-December 1982

A. CORE CROSS-SECTION
(4 cm. diameter)




B. CORE LONGITUDINAL SECTION
(10 - 15 cm)

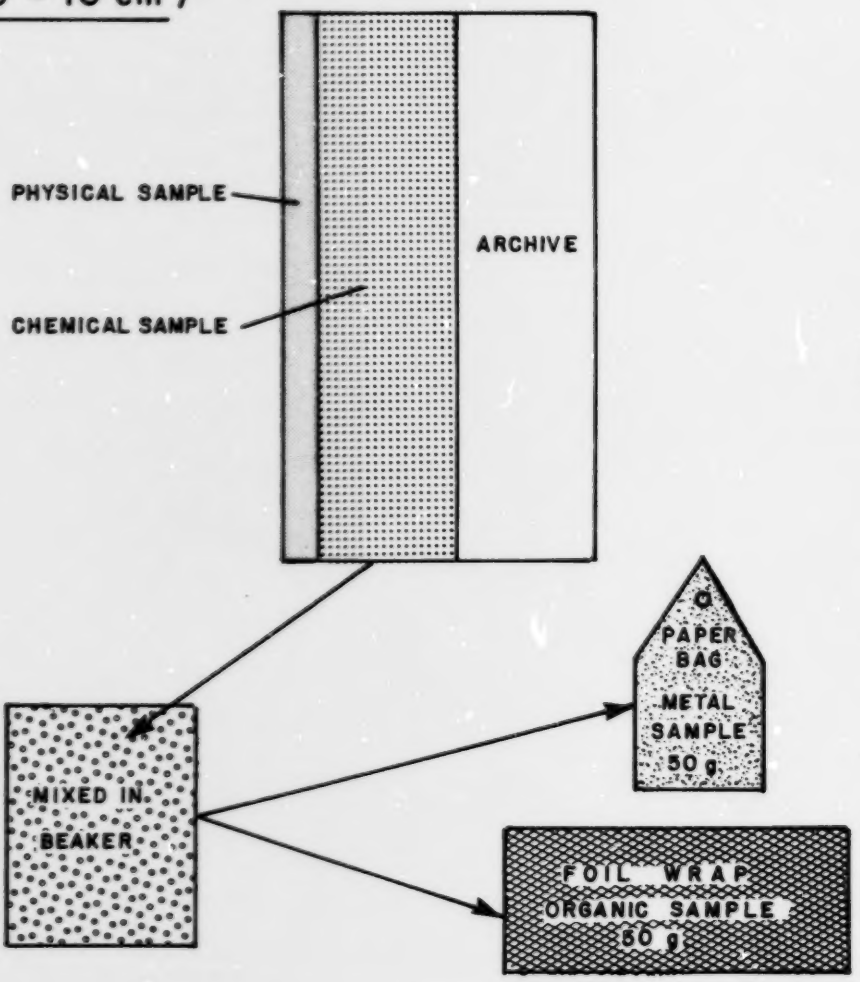



FIGURE 2 SUBSAMPLING PROCEDURES

samples were stored in hexane washed aluminum foil wraps. All samples were maintained at -20°C prior to laboratory analysis.

## 2.3 Analytical Procedures

Analytical procedures for trace metals in sediments are given in Appendix II. Certified reference sediments were included routinely during the analysis of sediments samples. A complete heavy metal scan was conducted on each core sample; however, results for cadmium (Cd), mercury (Hg), lead (Pb), arsenic (As), copper (Cu), zinc (Zn) and chromium (Cr) only were tabulated.

Organic analyses were completed for polychlorinated biphenyl (PCB), pentachlorophenol (PCP), and tetrachlorophenol (TCP). Analytical procedures for organic analyses are given in Appendix III.

## 3. RESULTS

Sediment chemistry results are presented in Table I. The tables also indicate depth in the core at which the sample was removed (or grab sample).

Analytical results for the reference sediment used by the DOE/DFO West Vancouver Laboratory are presented in Table II.

Graphic presentation of cadmium and mercury concentrations in excess of ODCA regulated limits are shown in Figures 3 and 4.

Lead concentrations in surface layer of benthic sediments are presented in Figure 5.

The relationship between sediment colour in the cores and cadmium concentration (expressed as above or below 0.6 ppm the ODCA regulated limit) is shown in Appendix I.

## ACKNOWLEDGEMENTS

The authors would like to acknowledge the efforts and co-operation of the staff of DOE/DFO West Vancouver Laboratory and of the B.C. Ministry of Environment Laboratory, and of Klohn Leonoff Consultants Ltd. Thanks is also due to B.C. Place Ltd. for funding the sample collection, and specifically, R. Waters, Environmental Consultant to B.C. Place for his time and effort in tabulating data and assisting in sample collection.

TABLE 1 SEDIMENT ANALYSIS RESULTS

Legend

All results are reported as ug/g dry weight (ppm) of the fine fraction (< 100 mesh). All depths are in meters below water sediment interface. Percent moisture is shown as %.

Sediment Description

| | |
|---|---|
| B - Black | o - organic |
| Br - Brown | si - silt |
| G - Grey | sd - sand |
| | g - gravel |
| | sh - shell |

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II COMPOUNDS
NOVEMBER - DECEMBER 1982

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 01 | 0-.3 | Bsd | 1.1 | .18 | 69 | 12 | 70.3 | 725 | 50.3 | < .002 | < .002 | .005 |
| | 02 | .9-1.2 | Bsi | < .3 | .16 | 26 | < 7 | 32.3 | 110 | 21.8 | .04 | < .002 | .005 |
| | | | (to 1.4 m) | < .3 | .16 | 25 | < 8 | 31.6 | 104 | 21.1 | | | |
| | 03 | 1.6-1.9 | Gsi | < .3 | .06 | < 3 | < 8 | 36.4 | 69.2 | 30.4 | | | |
| 1A | 01 | 0-.3 | Bo/si (.45 m) | 2.4 | .94 | 270 | 27 | 150 | 775 | 51.3 | | | |
| | 02 | .8-1.1 | Gsh/si/sd | < .3 | .09 | 5 | < 8 | 31.3 | 62.4 | 28.1 | | | |
| | 03 | 2-2.2 | Gsd | < .3 | .05 | < 3 | < 8 | 28.3 | 42.8 | 18.1 | | | |
| | | | | < .3 | .06 | < 3 | < 8 | 29.3 | 43.7 | 18.7 | | | |
| 2 | 01 | 0-.6 | Bo (1.2 m) | 2.1 | .61 | 481 | < 8 | 232 | 800 | 81.4 | .14 | .031 | .049 |
| | 02 | 1.2-1.5 | Gsi | < .3 | .07 | < 3 | < 8 | 35.9 | 70.1 | 34.1 | | | |
| | 03 | 3.2-3 5 | Gsi | < .3 | .05 | < 3 | < 8 | 51.8 | 93.5 | 27.7 | | | |
| | | | | < .3 | .05 | < 3 | < 7 | 52.4 | 93.3 | 27.7 | | | |
| 3 | 01 | 0-.4 | Bo (0.9 m) | 2.9 | .81 | 700 | < 8 | 285 | 931 | 82.7 | | | |
| | 02 | 1.7-2.0 | Gsi | < .3 | .06 | < 3 | < 8 | 56.7 | 98.4 | 31.3 | | | |
| | 03 | 2.4-2.7 | Gsi | < .3 | .05 | < 3 | < 8 | 26.6 | 56.9 | 20.2 | | | |
| | | | | < .3 | .05 | < 3 | < 8 | 25.4 | 55.4 | 17.9 | | | |
| 4 | See 4A-B | | | | | | | | | | | | |
| 4A | 01 | 0-.2 | Bo (0.9 m) | 2.5 | 1.03 | 567 | 9 | 234 | 985 | 85.4 | 1.1 | .006 | .020 |
| | 02 | 1.25-1.55 | Gsi | < .3 | .17 | 11 | < 8 | 44.3 | 95.6 | 33.5 | | | |
| | | | | < .3 | .16 | 8 | < 8 | 43.7 | 92.9 | 33.7 | | | |
| 4B | 01 | .6-.8 | Bo (1.7 m) | 3.7 | 1.99 | 986 | < 8 | 324 | 1370 | 121 | | | |
| | 02 | 1.8-2.05 | Gsi | < .3 | 0.07 | < 3 | < 8 | 49.1 | 86.7 | 42.1 | | | |
| | 03 | 2.95-3.25 | Gsi | < .3 | .03 | < 3 | < 8 | 22.3 | 52.3 | 21.1 | | | |
| | | | | < .3 | .03 | < 3 | < 8 | 23.9 | 49.9 | 20.5 | | | |
| 4C1 | 01 | 0-.3 | Gsi/osi | < .3 | .23 | 31 | < 8 | 49.2 | 112 | 50.9 | | | |
| | 02 | .3-.6 | Gsi/osi | < .3 | .16 | 8 | < 8 | 40.7 | 94.7 | 53.2 | | | |
| | 03 | 1.1-1.4 | Gsi/osi | < .3 | .14 | 5 | < 8 | 41.2 | 92.6 | 55.2 | | | |
| | 04 | 2.0-2.3 | Gsi/sd/g | < .3 | .08 | < 3 | < 8 | 46.8 | 72.8 | 48.0 | | | |
| 4C2 | 01 | 0-.3 | Bosi | 2.5 | .88 | 778 | < 8 | 312 | 71.5 | 81.2 | | | |
| | 02 | .6-1.1 | Gsi/sd | < .3 | .08 | < 3 | < 8 | 47.1 | 74.5 | 44.5 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 01 | .6-.9 | Bo (1.4 m) | 2.5 | 1.23 | 267 | < 8 | 193 | 937 | 66.0 | .85 | .033 | .050 |
| | 02 | 1.9-2.2 | Gsd | < .3 | .16 | 10 | < 8 | 28.3 | 70 | 24.3 | | | |
| | 03 | 3.-3.25 | Gsi | < .3 | .05 | < 3 | < 8 | 37.5 | 68.3 | 34.3 | | | |
| | | | | < .3 | .05 | < 3 | < 8 | 38.2 | 70.6 | 35.6 | | | |
| | 05 | 4.5-4.75 | Gsi | < .3 | .03 | < 3 | < 8 | 55.2 | 98.4 | 23.2 | | | |
| 6 | 01 | 0-.4 | Bo (1.4 m) | 1.3 | 1.11 | 196 | < 8 | 135 | 498 | 52.2 | | | |
| | 02 | 1.4-1.6 | Gsd | < .3 | .11 | 7 | < 8 | 18.3 | 48.5 | 19.4 | | | |
| | 03 | 2.3-2.7 | Gsd/sd | < .3 | .05 | < 3 | < 8 | 41.6 | 81.8 | 20.1 | | | |
| | | | | < .3 | .05 | < 3 | < 8 | 43.1 | 77.2 | 20.6 | | | |
| 7 | 01 | 0-.3 | Bo | 3.0 | 1.03 | 583 | < 8 | 223 | 1060 | 97.2 | | | |
| | | | | 3.0 | 1.05 | 579 | < 8 | 217 | 1050 | 95.7 | | | |
| | 02 | 1.9-2.1 | Gsi | < .3 | .12 | < 3 | < 8 | 47.3 | 91.7 | 41.8 | | | |
| | | | | < .3 | .10 | 4 | < 8 | 48.1 | 90.9 | 41.3 | | | |
| 8 | 01 | 0-.3 | Bo | 1.6 | .67 | 275 | < 8 | 164 | 864 | 63.3 | 1.1 | .007 | .039 |
| | | | | 1.6 | .68 | 279 | < 7 | 163 | 870 | 62.2 | | | |
| | 02 | 0.7-.9 | Gsi/sd | < .3 | .03 | < 3 | < 8 | 26.3 | 68.4 | 29.3 | | | |
| | | | | < .3 | .03 | < 3 | < 8 | 26.0 | 66.5 | 29.7 | | | |
| 9 | 01 | 0-.35 | Gsi | < .3 | .15 | 18 | < 8 | 42.9 | 89.3 | 29.2 | < .02 | < .002 | .003 |
| | | | | < .3 | .16 | 15 | < 8 | 40.6 | 87.2 | 29.4 | | | |
| | 02 | .7 | Gsi | < .3 | .17 | 5 | < 8 | 45.5 | 97.0 | 49.1 | | | |
| | | | | < .3 | .11 | 5 | < 8 | 46.8 | 98.0 | 50.4 | | | |
| | 03 | 1.4 | Gsi/Bo (.5 m Lense) | 2.4 | .95 | 164 | < 8 | 146 | 351 | 58.6 | < .02 | < .002 | < .002 |
| | | | | 2.4 | 1.10 | 154 | 12 | 143 | 350 | 56.9 | | | |
| | 04 | 1.7 | Gsd | < .3 | .09 | < 3 | < 8 | 7.6 | 31.2 | 7.7 | < .02 | < .002 | < .002 |
| | | | | < .3 | .07 | 4 | < 8 | 8.8 | 35.3 | 10.6 | | | |
| | 05 | 2.7 | Gsd | < .3 | .10 | < 3 | < 8 | 29.8 | 59.3 | 29.1 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 26.0 | 56.4 | 27.2 | | | |
| 10 | 01 | 0-.3 | Bo | 1.0 | 2.22 | 153 | < 8 | 117 | 379 | 58.8 | .29 | .010 | .008 |
| | | | | 1.0 | 2.15 | 149 | < 8 | 115 | 375 | 57.7 | | | |
| | 02 | .3-.75 | sdgr | < .3 | .05 | < 3 | < 8 | 30.5 | 73.1 | 23.4 | < .02 | < .002 | < .002 |
| | | | | < .3 | .06 | < 3 | < 8 | 31.1 | 72.4 | 24.4 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE 1 & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 01 | 0-.3 | Bro | < .3 | .52 | 89 | < 8 | 83.9 | 202 | 40.8 | | | |
| | 02 | .3-.55 | Gsi | < .3 | .09 | < 3 | < 8 | 60.0 | 93.4 | 42.7 | | | |
| | 03 | 1-1.25 | Gsi | < .3 | .05 | < 3 | < 8 | 30.0 | 58.1 | 31.2 | | | |
| | | | | < .3 | .05 | < 3 | < 8 | 30.7 | 57.6 | 31.5 | | | |
| 12* | 01 | 0-.25 (estimate) | Bo | 2.1 | 0.44 | 415 | 10 | 223 | 905 | 89.7 | | | |
| 13 | 01 | 0-.3 | Bo | 1.0 | .42 | 137 | < 8 | 123 | 376 | 48.6 | .27 | .070 | .089 |
| | | | (.6 m) | .5 | .38 | 124 | < 8 | 80.3 | 327 | 44.9 | | | |
| | 02 | 1.0 | Gsi | < .3 | .07 | < 3 | < 8 | 20.7 | 42.5 | 22.3 | < .02 | < .002 | < .002 |
| | | | | < .3 | .07 | < 3 | < 8 | 21.5 | 42.8 | 22.7 | | | |
| | 03 | 2.7-3.0 | Gsi | < .3 | .11 | 10 | < 8 | 34.6 | 85.7 | 29.5 | | | |
| | | | | < .3 | .12 | 26 | < 8 | 36.7 | 93.3 | 30.1 | | | |
| | 04 | 3.8 | Gsi | < .3 | .08 | < 3 | < 8 | 48.9 | 86.0 | 20.9 | | | |
| 13A | 01 | 0-.3 | Gsi/o | < .3 | .17 | 19 | < 8 | 361 | 85.9 | 41.7 | | | |
| | 02 | .3-.7 | Gsi/o | .4 | .39 | 141 | < 8 | 351 | 203 | 40.5 | | | |
| | 03 | .7-1.0 | Gsi/o/sh | 3.6 | .81 | 341 | < 8 | 379 | 520 | 50.1 | | | |
| | 04 | 1.4-1.7 | Gsi/o/sh | < .3 | .20 | 14 | < 8 | 402 | 93.4 | 38.5 | | | |
| 14 | 1 | 0-.3 | Bo | 2.6 | .78 | 252 | 9 | 155 | 853 | 71.5 | | | |
| | 2 | 0.8-1.1 | Bo | < .3 | .70 | 84 | < 8 | 88.1 | 281 | 46.4 | | | |
| | | | (to 2.5 m) | < .3 | .70 | 86 | < 8 | 88.4 | 286 | 48.2 | | | |
| | 3 | 2.85-3 | sd/si | < .3 | .02 | < 3 | < 8 | 15.5 | 34.5 | 13.9 | | | |
| | | | | < .3 | .03 | < 3 | < 8 | 15.4 | 33.5 | 13.9 | | | |
| 15 | 01 | 0-.25 | Bo | 3.1 | 1.08 | 257 | < 8 | 179 | 815 | 71.3 | .07 | .023 | .036 |
| | 02 | .25-.50 | Gsd/osi | < .3 | .76 | 60 | < 8 | 65.5 | 159 | 36.7 | < .02 | .002 | < .002 |
| | 03 | .5-.75 | Gsd | < .3 | .05 | < 3 | < 8 | 25.5 | 62.6 | 20.8 | | | |
| | | | | < .3 | .04 | < 3 | < 8 | 26.1 | 62.4 | 21.4 | | | |
| 16 | 01 | 0-.25 | Bo | 3.3 | 1.13 | 231 | < 8 | 144 | 1170 | 63.8 | | | |
| | 02 | .25-.50 | Gsi | < .3 | .05 | 5 | < 8 | 29.0 | 61.4 | 19.7 | | | |
| | 03 | .5-.75 | Gsi | < .3 | .07 | 4 | < 8 | 31.1 | 55.9 | 19.7 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 30.8 | 50.6 | 19.0 | | | |
| 17** | 01 | 0-.25 (estimate) | Bo | 1.6 | 0.31 | 258 | < 8 | 163 | 552 | 67.4 | | | |
| 18** | 01 | Surface | Bo | 2.1 | 0.5 | 285 | < 8 | 173 | 688 | 80.2 | | | |
| | 02 | Till | Gsi/sd | | | | | | | | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 01 | 0-.25 | Bo | 4.5 | 1.2 | 681 | 9 | 246 | 1830 | 114 | .28 | .018 | .072 |
| | 02 | .25-.50 | Gsd/si | 5.8 | .75 | 193 | 10 | 158 | 1100 | 71.4 | | | |
| | 03 | .75-1.0 | Gsd | < .3 | .12 | < 3 | < 8 | 26.7 | 65.7 | 22.2 | | | |
| | | | | < .3 | .11 | < 3 | < 8 | 24.8 | 61.2 | 20.9 | | | |
| 20 | 1 | 0-.25 | Bo | 3.4 | 1.11 | 364 | 8 | 189 | 1280 | 95.5 | .45 | .022 | .040 |
| | | | (.6 m) | 3.4 | 1.10 | 364 | 12 | 190 | 1280 | 92.8 | | | |
| | 2 | .9-1.16 | Gsi/sd | < .3 | .08 | < 3 | < 8 | 28.9 | 71.3 | 30.1 | | | |
| | | | | < .3 | .06 | < 3 | < 8 | 29.3 | 68.4 | 29.3 | | | |
| 21 | 1 | 0-.3 | bo | 4.5 | 1.42 | 339 | 22 | 186 | 1290 | 95.0 | | | |
| | | | (.33 m) | 4.6 | 1.37 | 343 | 17 | 181 | 1270 | 93.7 | | | |
| | 2 | .4-.55 | Gsi | < .3 | .06 | < 3 | < 8 | 25.6 | 68.8 | 29.7 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 25.1 | 67.6 | 30.1 | | | |
| 22 | ** 01 | 0-.25 | Bo | 1.4 | 0.07 | 274 | < 8 | 168 | 515 | 74.6 | | | |
| | | .25-.50 | sd/si/o | | | | | | | | | | |
| 23 | | Surface | Grsd | SMALL SAMPLE | | | | | | | | | |
| 24 | 01 | 0-.12 | Bo | 5.2 | 1.51 | 297 | < 8 | 160 | 896 | 83.9 | .18 | .006 | .012 |
| | | | | 5.2 | 1.52 | 292 | < 8 | 168 | 905 | 83.9 | | | |
| | 02 | .12-.28 | Grsi | < .3 | .26 | 19 | < 8 | 28.8 | 81.4 | 26.1 | < .02 | < .002 | < .002 |
| | | | | < .3 | .23 | 17 | < 8 | 27.9 | 86.3 | 26.1 | | | |
| | 03 | .28-.54 | | < .3 | .06 | < 3 | < 8 | 18.1 | 45.9 | 23.9 | | | |
| | | | | < .3 | .10 | < 3 | < 8 | 18.7 | 49.4 | 23.8 | | | |
| 25 | 01 | 0-.3 | Bo | 5.6 | 2.08 | 264 | < 8 | 217 | 485 | 76 | | | |
| | 02 | .8-1.07 | Bo | < .3 | .25 | 22 | < 8 | 40.5 | 49.7 | 30.7 | | | |
| 26 | 01 | 0-.3 | Gsi | < .3 | .59 | 54 | < 8 | 59.1 | 133 | 35.4 | | | |
| | | | | < .3 | .67 | 51 | < 8 | 65.4 | 135 | 34.3 | | | |
| | 02 | 0.3-.6 | sd/gr | < .3 | .38 | 13 | < 8 | 35.3 | 72.1 | 27.8 | | | |
| | 03 | 0.6-.9 | sd/gr | < .3 | .20 | < 3 | < 8 | 17.1 | 35.7 | 17.1 | | | |
| 27 | 01 | 0.7-.9 | Bo | 1.4 | .45 | 112 | < 8 | 66.5 | 371 | 36.5 | .10 | .006 | .010 |
| | | | (1.03 m) | 1.4 | .46 | 106 | < 8 | 64.5 | 362 | 35.8 | | | |
| | 02 | 1.55-1.8 | Gsi | < .3 | .19 | < 3 | < 8 | 13.2 | 38.1 | 16.0 | | | |
| | | | | < .3 | .17 | < 3 | < 8 | 11.5 | 35.8 | 14.1 | | | |
| 27A | 01 | 0-.3 | Bosi | 5.1 | 3.5 | 433 | 8 | 214 | 1080 | 110 | | | |
| | 02 | 0.86-1.15 | Gsi | < .3 | .2 | 19 | < 8 | 52.7 | 141 | 56.8 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 03 | 1.15-1.45 | Gsi/sd | < .3 | .19 | 5 | < 8 | 34.4 | 77.4 | 39.8 | | | |
| | 04 | 1.45-1.75 | Gsi/sd | < .3 | .18 | 16 | < 8 | 31.9 | 76.2 | 35.8 | | | |
| | 05 | 1.75-2.0 | Gsi/sd/g | < .3 | .31 | 220 | < 8 | 108 | 198 | 33.3 | | | |
| 28 | 01 | 0-.25 | Brsd | < .3 | .08 | < 3 | < 7 | 17.8 | 39.3 | 16.9 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 17.6 | 40.2 | 17.3 | | | |
| | 02 | .97-1.22 | Gsi | < .3 | .08 | < 3 | < 8 | 48.5 | 82.6 | 27.5 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 48.3 | 81.9 | 27.7 | | | |
| 29 | Bag Sample | Surface | Gsd/gr sonesh/si | | | SMALL SAMPLE | | | | | | | |
| 30 | 01 | 0-.25 | Bo | 20.3 | 6.5 | 402 | < 8 | 239 | 599 | 68.5 | | | |
| | 02 | .4 | Gsi | < .3 | .07 | < 3 | < 8 | 14.4 | 36.7 | 13.6 | | | |
| 31 | 01 | 0-.1 | Bo/sh | < .3 | .32 | 58 | < 8 | 87.1 | 1000 | 47.9 | | | |
| | 02 | .16-.32 | Gsi | < .3 | .14 | < 3 | < 8 | 57.8 | 101 | 37.4 | | | |
| | 03 | .32-.48 | Gsi/sd | < .3 | .14 | < 3 | < 8 | 53.9 | 89.1 | 25.1 | | | |
| | | | | < .3 | .14 | < 3 | < 8 | 57.1 | 91.8 | 28.4 | | | |
| | 04 | .5-.7 | Gsd/gr | < .3 | .12 | < 3 | < 8 | 24.9 | 45.6 | 18.9 | | | |
| | 05 | 1.55-1.73 | Gsd/si | < .3 | .18 | < 3 | < 8 | 25.3 | 49.7 | 23.6 | | | |
| 32 | 01 | 0-.15 | Bosd | < .3 | .20 | 20 | < 8 | 18.5 | 70.9 | 16.3 | < .02 | .006 | .011 |
| | | | | < .3 | .23 | 25 | < 8 | 20.7 | 69.2 | 17.2 | | | |
| | 02 | .3 | Gsi | < .3 | .15 | < 3 | < 8 | 49.4 | 91.5 | 22.1 | < .02 | < .002 | < .002 |
| 33 | 01 | 0-.3 | Bo | 3.8 | 1.32 | 225 | 16 | 155 | 562 | 69.9 | | | |
| | 02 | 1-1.25 | Gsi/sd | < .3 | 0.21 | 12 | < 8 | 39.1 | 88.2 | 41.9 | | | |
| | 03 | 1.65-1.9 | Gsd | < .3 | 0.09 | < 3 | < 8 | 30.4 | 58.5 | 25.5 | | | |
| 34 | 01 | 0-.3 | Bo | 1.7 | 1.07 | 155 | < 8 | 126 | 341 | 53.3 | | | |
| | 02 | 1-1.25 | Gsi/sd | < .3 | .15 | 8 | < 8 | 20.6 | 55.6 | 22.8 | | | |
| | 03 | 1.3-1.55 | Gsd | < .3 | .07 | < 3 | < 8 | 18.5 | 34.9 | 19.7 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 17.8 | 35.4 | 18.1 | | | |
| 35 | 01 | 0-.4 | Bo | 1.1 | .43 | 389 | < 8 | 231 | 501 | 45.7 | | | |
| | | | | 1.3 | .44 | 383 | < 8 | 230 | 479 | 45.1 | | | |
| | 02 | 1.9-2.15 | Gsi | < .3 | .08 | < 3 | < 8 | 29.8 | 54.5 | 28.0 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 31.3 | 54.0 | 27.5 | | | |
| | 03 | 2.5-2.75 | Gsi | < .3 | .07 | < 3 | < 8 | 49.4 | 86.9 | 26.7 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 49.3 | 86.8 | 26.6 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | 01 | 0-.45 | Bo | 1.0 | .45 | 153 | < 8 | 131 | 377 | 58.3 | | | |
| | | | | 1.3 | .41 | 158 | < 8 | 129 | 376 | 58.1 | | | |
| | 02 | 1.1-1.35 | Gsi | < .3 | .08 | < 3 | < 8 | 47.9 | 77.7 | 38.0 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 50.3 | 80.7 | 39.8 | | | |
| | 03 | 2.05-2.3 | Gsi | < .3 | .08 | < 3 | < 8 | 47.4 | 74.4 | 43.0 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 47.2 | 74.1 | 43.9 | | | |
| 36A | 01 | 0-.2 | Bo | 2.2 | .63 | 294 | 11 | 199 | 734 | 80.8 | | | |
| | | | | 2.5 | .55 | 300 | < 8 | 201 | 736 | 81.2 | | | |
| | 02 | .2-.4 | Gsi | < .3 | .10 | 6 | < 8 | 41.7 | 88.5 | 35.2 | | | |
| | | | | < .3 | .09 | 6 | < 8 | 40.4 | 86.2 | 33.2 | | | |
| | 03 | .4-.65 | Gsi | < .3 | .09 | < 3 | < 8 | 57.7 | 83.3 | 42.1 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 57.9 | 83.6 | 43.0 | | | |
| | 04 | 1.55-1.8 | Gsi | < .3 | .17 | < 3 | < 8 | 50.9 | 75.1 | 41.7 | | | |
| | | | | < .3 | .18 | < 3 | < 8 | 50.9 | 75.0 | 41.7 | | | |
| 37 | 01 | 0-.3 | Bro | < .3 | .66 | 42 | < 8 | 60.4 | 126 | 34.9 | < .02 | .002 | .003 |
| | 02 | .3-.55 | Gsd | < .3 | .13 | < 3 | < 8 | 26.9 | 48 | 20.8 | | | |
| | 03 | 1.1-1.35 | Gsd | < .3 | .10 | < 3 | < 7 | 19.5 | 40.2 | 18.7 | | | |
| | | | | < .3 | .10 | < 3 | < 8 | 17.5 | 39.7 | 17.9 | | | |
| 38 | 01 | 0-.35 | Gsi | < .3 | .15 | 11 | < 8 | 40.1 | 92.2 | 28.7 | | | |
| | | | | < .3 | .16 | 11 | < 8 | 39.8 | 96.6 | 28.6 | | | |
| 39 | 01 | 0-.4 | Bo | .3 | .23 | 153 | < 8 | 119 | 235 | 34.0 | | | |
| | | | (0.8 m) | .4 | .23 | 144 | < 8 | 128 | 249 | 33.9 | | | |
| | 02 | 1.1-1.3 | Gsi | < .3 | .08 | < 3 | < 8 | 29.7 | 53.7 | 28.6 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 29.7 | 53.5 | 28.6 | | | |
| | 03 | 2.2-2.5 | Gsi/sh | < .3 | .10 | < 3 | < 8 | 39.4 | 65.1 | 33.8 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 39.2 | 64.6 | 32.2 | | | |
| | 05 | 3.7-4.0 | Gsi | < .3 | .08 | < 3 | < 8 | 45.1 | 74.3 | 42.3 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 43.9 | 73.5 | 42.4 | | | |
| | 06 | 5.-5.3 | Gsi | < .3 | .08 | < 3 | < 8 | 44.9 | 74.5 | 40.9 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 43.8 | 73.9 | 42.3 | | | |
| 40 | 01 | 0-.30 | Bo/sh | 0.4 | .22 | 22 | < 8 | 32.1 | 101 | 23.9 | | | |
| | 02 | .7 | Gsi | < .3 | .12 | < 3 | < 8 | 41.5 | 75.8 | 39.3 | | | |
| | | | | < .3 | .12 | < 3 | < 8 | 42.9 | 76.5 | 40.7 | | | |
| | 03 | 1.7 | Gsi | < .3 | .10 | < 3 | < 8 | 43.7 | 77.3 | 37.0 | | | |
| | | | | < .3 | .11 | < 3 | < 8 | 43.0 | 75.6 | 36.3 | | | |
| | 04A | 2.0 | Gsi | SMALL SAMPLE | | | | | | | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | 01 | 0-.3 | Bo | 1.1 | .46 | 133 | < 8 | 105 | 304 | 48.6 | | | |
| | | | (0.4 m) | 1.2 | .56 | 130 | 9 | 98.3 | 289 | 48.7 | | | |
| | 02A | .67-1.0 | Gsi/sd | < .3 | .04 | < 3 | < 8 | 39.9 | 67 | 36.5 | | | |
| | 02 | 1.05-1.35 | Gsi | < .3 | .10 | < 3 | < 8 | 53.0 | 77.7 | 40.3 | | | |
| | | | | < .3 | .09 | < 3 | < 8 | 52.0 | 82.2 | 42.3 | | | |
| 42 | 01 | 0-.75 | Bo | 2.2 | .62 | 241 | 14 | 162 | 693 | 76.6 | | | |
| | | | (1.13 m) | 2.1 | .54 | 238 | 8 | 163 | 685 | 75.1 | | | |
| | 02 | 1.13-1.37 | Gsi | < .3 | .96 | 47 | < 8 | 60.6 | 134 | 41.2 | | | |
| | | | | < .3 | .91 | 48 | < 8 | 61.5 | 135 | 41.6 | | | |
| | 03 | 1.42-1.82 | sh/sd | < .3 | .19 | 7 | < 8 | 22.2 | 42.4 | 20.0 | | | |
| | | | | < .3 | .17 | 12 | < 8 | 22.4 | 42.1 | 19.1 | | | |
| | 04 | 2.42-2.62 | g | < .3 | .17 | < 3 | < 8 | 24.0 | 44.7 | 29.7 | | | |
| | | | | < .3 | .17 | < 3 | < 8 | 22.6 | 44.7 | 30.1 | | | |
| 43 | 01 | 0-.3 | Bo | < .3 | .27 | 59 | < 8 | 75.1 | 198 | 44.6 | | | |
| | | | | < .3 | .28 | 60 | < 8 | 77 | 202 | 45.9 | | | |
| | 02 | .5-.7 | Gsi | < .3 | .15 | < 3 | < 8 | 56.1 | 76.1 | 42.5 | | | |
| | 03 | .7-.9 | Gsi | < .3 | .14 | < 3 | < 8 | 46.3 | 70.4 | 45.2 | | | |
| | 04 | 1.3-1.6 | Gsi | < .3 | .06 | < 3 | < 8 | 42.7 | 73.9 | 20.7 | | | |
| | | | | < .3 | .06 | < 3 | < 8 | 43.6 | 75.8 | 21.6 | | | |
| 44 | 01 | 0-.3 | Bo | < .3 | .63 | 260 | 18 | 127 | 478 | 41.8 | | | |
| | 02 | .3-.55 | Gsd/si | < .3 | .05 | < 3 | < 8 | 31.7 | 85.5 | 24.8 | | | |
| | 03 | .6-.9 | Gsd/si | < .3 | .04 | < 3 | < 8 | 29.3 | 73.5 | 24.6 | | | |
| 45A | ** 01 | Surface | Brsd | 0.9 | .28 | 159 | < 8 | 111 | 395 | 51.4 | | | |
| 46 | ** 01 | Surface | Bo | 0.6 | .37 | 217 | < 8 | 171 | 453 | 72.3 | | | |
| 47 | 01 | 0-.3 | Bo | 1.9 | .73 | 218 | 8 | 149 | 571 | 70.6 | 0.12 | .005 | .018 |
| | | | | 1.9 | .55 | 219 | 12 | 154 | 571 | 70.2 | | | |
| | 02 | 1.25-1.5 | si/sd/gr | < .3 | .11 | < 3 | < 8 | 25.9 | 59.7 | 28.2 | | | |
| | | | | < .3 | .10 | < 3 | < 8 | 27.3 | 60.1 | 28.0 | | | |
| 48 | 01 | 0-.35 | Br/sd | < .3 | .12 | < 3 | < 8 | 25.5 | 57.1 | 23.1 | | | |
| | 02 | .75-.9 | Gsd | < .3 | .13 | < 3 | < 8 | 16.1 | 33.9 | 19 | | | |
| 49 | 01 | 0-.3 | Bo | < .3 | .23 | 117 | < 8 | 87.1 | 256 | 38.9 | | | |
| | 02 | .3-.6 | Gsd/g | < .3 | .04 | < 3 | < 8 | 18.1 | 39.1 | 17.9 | | | |
| | 03 | .6-.75 | Gsd/si | < .3 | .05 | < 3 | < 8 | 17.5 | 41.4 | 18.7 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 01 | 0-.3 | Brsd | < .3 | .08 | < 3 | < 8 | 19.7 | 56.6 | 20.9 | | | |
| | | | | < .3 | .12 | < 3 | < 8 | 18.2 | 48.7 | 17.8 | | | |
| 51 | 01 | 0-.20 | Bo | 2.8 | .88 | 320 | 20 | 201 | 791 | 78.1 | | | |
| | | | (0.4 m) | 2.8 | .87 | 316 | 12 | 200 | 791 | 75.8 | | | |
| | 02 | 0.4-.6 | Gsd/si | < .3 | .15 | 4 | < 8 | 11.6 | 32.7 | 12.4 | | | |
| | | | | < .3 | .17 | 6 | < 8 | 12.4 | 34.1 | 13.6 | | | |
| | 03 | 0.6-.8 | Gsd/si | < .3 | .11 | < 3 | < 8 | 10.7 | 25.2 | 12.9 | | | |
| | | | | < .3 | .11 | < 3 | < 8 | 14.3 | 25.9 | 11.2 | | | |
| | 04 | 0.8-.95 | Gsi | < .3 | .16 | < 3 | < 8 | 20.1 | 51.1 | 24.1 | | | |
| | | | | < .3 | .17 | < 3 | < 8 | 20.4 | 58.8 | 25.6 | | | |
| 52 | 01 | 0-.2 | Bo | 0.8 | 2.41 | 154 | < 8 | 129 | 409 | 60.4 | | | |
| | | | | 0.8 | 1.78 | 158 | < 8 | 133 | 406 | 59.1 | | | |
| | 02 | .2-.35 | Gsi | < .3 | 0.55 | 29 | < 8 | 32.6 | 88.7 | 25.2 | | | |
| 53 | 01 | 0-.25 | Bo | < .3 | .17 | 47 | < 8 | 61.6 | 157 | 47.8 | | | |
| | | | (0.1 m) | < .3 | .26 | 46 | < 8 | 60.4 | 162 | 48.6 | | | |
| | 02 | .25-.5 | Gsi | < .3 | 1.16 | < 3 | < 8 | 68.1 | 86.1 | 46.2 | | | |
| 54 | 01 | 0-.30 | Bsi/wd | 2.3 | 1.05 | 321 | < 8 | 118 | 484 | 45.6 | .10 | .012 | .022 |
| | | | | 2.4 | 1.13 | 390 | 14 | 120 | 549 | 48.0 | | | |
| | 02 | .7 | sh | < .3 | .08 | 17 | < 8 | 14.0 | 11.3 | 3.7 | < .02 | < .002 | < .002 |
| | | | | < .3 | .06 | 6 | < 8 | 3.2 | 8.8 | 5.0 | | | |
| | 03 | 1.5 | Gsi | < .3 | .09 | < 3 | 32 | 37.1 | 62.2 | 33.8 | | | |
| | | | | < .3 | .08 | < 3 | 19 | 42.2 | 70.1 | 32.9 | | | |
| 55 | 01 | 0-.25 | si/sh | 0.4 | .34 | 31 | < 8 | 52.4 | 218 | 44.7 | | | |
| | | | | 0.5 | .30 | 33 | < 8 | 51.0 | 116 | 39.4 | | | |
| | 02 | .5 | sh | < .3 | .06 | 5 | < 8 | 22.5 | 47.3 | 19.8 | | | |
| | | | | < .3 | .07 | 4 | < 8 | 18.4 | 38.6 | 15.1 | | | |
| | 03 | 1.3 | Gsi | < .3 | .08 | < 3 | < 8 | 15.2 | 37.3 | 17.9 | | | |
| | | | | < .3 | .09 | < 3 | < 8 | 14.4 | 36.6 | 15.9 | | | |
| 56 | 01 | 0-.3 | Bo | < .3 | .38 | 58 | < 8 | 70.0 | 173 | 41.6 | | | |
| | | | (0.5 m) | < .3 | .41 | 57 | < 8 | 72.6 | 177 | 39.9 | | | |
| | 02 | 1.15-1.4 | Gsi/sd | < .3 | .16 | < 3 | < 8 | 26.8 | 59.8 | 25.1 | | | |
| | | | | < .3 | .17 | < 3 | < 8 | 26.7 | 59.4 | 26.0 | | | |
| 57 | 01 | 0-.25 | Bo | 2.0 | .7 | 161 | < 8 | 135 | 493 | 60.9 | 0.10 | .007 | .016 |
| | 02 | .25-.35 | sh | < .3 | .11 | 8 | < 8 | 31.8 | 69.3 | 36.2 | < .02 | < .002 | < .002 |
| | | | | < .3 | .11 | 7 | < 8 | 31.2 | 70 | 35.6 | | | |
| | | .35-.5 | Gsd | | | | | | | | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58 | 01 | 0-.28 | Bo | 1.4 | .93 | 201 | 12 | 96.6 | 313 | 33.1 | | | |
| | | | | 1.3 | .94 | 187 | < 8 | 79.5 | 302 | 33.4 | | | |
| | 01A | .28-.72 | Gsd/si | < .3 | .07 | 4 | < 8 | 12 | 33.3 | 15.7 | | | |
| | 02B | 1.5-1.7 | | < .3 | .04 | < 3 | < 8 | 8.4 | 26.0 | 12.7 | | | |
| | 02 | 1.7 | Gsd/si | < .3 | .06 | 4 | < 8 | 4.5 | 18.9 | 5.9 | | | |
| | | | | < .3 | .05 | < 3 | < 8 | 5.2 | 20.5 | 5.0 | | | |
| | 03A | 1.8-2.0 | Gsi | < .3 | .07 | < 3 | < 8 | 47.4 | 69.4 | 48.3 | | | |
| | 03 | 2.0-2.3 | Gsi | < .3 | .13 | < 3 | < 8 | 41.5 | 64.6 | 36.0 | | | |
| | | | | < .3 | .13 | < 3 | < 8 | 47.3 | 73.4 | 39.6 | | | |
| | 04 | | | < .3 | .07 | < 3 | < 8 | 30.3 | 56.6 | 35.0 | | | |
| 58A | 01 | | | < .3 | .18 | 25 | < 8 | 27.2 | 70.5 | 28.8 | | | |
| | 02 | | | < .3 | .08 | 9 | < 8 | 37.0 | 78 | 41.2 | | | |
| | 03 | | | < .3 | .07 | 9 | < 8 | 30.4 | 68 | 35.2 | | | |
| | 04 | | | < .3 | .06 | < 3 | < 8 | 22.4 | 45.5 | 26.6 | | | |
| 59 | 01 | 0-.30 | Bo | 2.8 | .94 | 199 | 8 | 153 | 422 | 65.4 | < .02 | .004 | .009 |
| | | | | 2.6 | .84 | 182 | 21 | 147 | 386 | 60.5 | | | |
| | 02 | .7 | si/sh | < .3 | .06 | < 3 | < 8 | 7.6 | 26.9 | 8.3 | | | |
| | | | | .5 | .12 | < 3 | < 8 | 13 | 36.5 | 14.5 | | | |
| | 03 | 2.0-2.3 | Gsi | < .3 | .10 | < 3 | < 8 | 49.6 | 88.2 | 23.5 | | | |
| | | | | < .3 | .09 | < 3 | < 8 | 43.3 | 86.9 | 22.3 | | | |
| 60 | 01 | 0-.3 | Gsi | 1.0 | .53 | 99 | < 8 | 89.9 | 233 | 41.6 | | | |
| | | | | 1.3 | .53 | 103 | < 8 | 93.2 | 241 | 43.0 | | | |
| | 02 | .6-.9 | Gsi | < .3 | .08 | < 3 | < 8 | 15.5 | 38 | 16.7 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 15.5 | 37.3 | 17.5 | | | |
| 61 | 01 | 0-.5 | Bo | < .3 | .37 | 117 | < 8 | 122 | 338 | 57.5 | | | |
| | 02 | .5-.75 | Bsi | < .3 | .07 | < 3 | < 8 | 41.8 | 92.2 | 34.4 | | | |
| 62 | 01 | 0-.3 | Bosi | < .3 | .25 | 73.0 | < 8 | 71.8 | 201 | 46.8 | | | |
| | 02 | .3-.6 | Brsi/sd | < .3 | .05 | < 3 | < 8 | 24.0 | 64.1 | 32.1 | | | |
| 63 | 01 | 0-.44 | Bsi/wd | 1.0 | .1 | 31 | < 8 | 34.4 | 112 | 24.2 | .02 | .006 | .005 |
| | 01A | | | < .3 | .07 | < 3 | < 8 | 24.3 | 51.3 | 26.9 | .20 | .010 | .013 |
| | 02 | 1.1 | Gsi | 0.6 | .06 | 6 | < 8 | 24.1 | 45.3 | 27.2 | | | |
| | 02A | | | .4 | .04 | 4 | < 8 | 20.6 | 33.8 | 19.2 | | | |
| | 03 | 2.1 | Gsi/sh | < .3 | .05 | 6 | < 8 | 9.9 | 20.8 | 12.7 | | | |
| | 05A | | | < .3 | .05 | < 3 | < 8 | 54.8 | 76.0 | 37.9 | | | |
| | 06 | 3.5 | Gsi/sh | < .3 | .11 | 12 | < 8 | 51.6 | 79.7 | 53.8 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 64 | 01 | 0-.3 | Bro | < .3 | .16 | 10 | < 8 | 37.8 | 72.5 | 33.3 | | | |
| | | | | < .3 | .16 | 9 | < 8 | 36.2 | 71.5 | 32.2 | | | |
| | 02 | .54-.79 | Gsi | < .3 | .09 | < 3 | < 8 | 53.4 | 79.4 | 41.0 | | | |
| | | | | < .3 | .09 | < 3 | < 8 | 55.3 | 82.4 | 43.5 | | | |
| | 03 | 1.94-2.16 | Gsi | < .3 | .12 | < 3 | < 8 | 46.8 | 88.7 | 23.3 | | | |
| | | | | < .3 | .12 | < 3 | < 8 | 47.1 | 89.7 | 24.0 | | | |
| 65 | 01 | 0-.25 | Bo | .4 | .34 | 98 | < 8 | 120 | 309 | 40.7 | < .02 | .005 | .008 |
| | | | (to .15 m) | .6 | .35 | 95 | < 8 | 118 | 303 | 40.7 | | | |
| | 02 | .25-.5 | Gsi | .4 | .11 | 5 | < 8 | 30.4 | 50.9 | 26.9 | | | |
| | 03 | 3.45-3.75 | Gsd | < .3 | .06 | < 3 | < 8 | 52.9 | 80.4 | 44.4 | | | |
| 66 | 01 | 0-.25 | Bo | < .3 | .09 | 20 | < 8 | 41.1 | 120 | 37.0 | | | |
| | 02 | .25-.5 | Br si/sd | < .3 | .05 | < 3 | < 8 | 28.2 | 61.5 | 30.4 | | | |
| 67 | 01 | 0-.3 | Bo | 1.6 | .56 | 134 | < 8 | 116 | 515 | 59.6 | | | |
| | 02 | 0.7- | Gsi/sh | < .3 | .11 | 11 | < 8 | 27.4 | 49 | 26.1 | | | |
| | 03 | 1.5- | Gsd/sh | < .3 | .06 | < 3 | < 8 | 14.0 | 35.7 | 19.6 | | | |
| | 04 | 2.2- | Gsd/sh | < .3 | .07 | 5 | < 8 | 21.8 | 42.5 | 23.6 | | | |
| | 05 | 3.0- | sd/sh | < .3 | .12 | 17 | < 8 | 18.8 | 35.2 | 22.1 | | | |
| | 06 | 3.2- | sd/sh | < .3 | .08 | 4 | < 8 | 6.9 | 20.8 | 18.6 | | | |
| | 07 | 4.5- | Gsi | < .3 | .04 | < 3 | < 8 | 23.3 | 47.7 | 30.5 | | | |
| 68 | 01 | 0-.15 | Bo | 1.2 | .57 | 159 | 9 | 181 | 444 | 64.5 | | | |
| | | | | 1.2 | .55 | 163 | 10 | 173 | 450 | 65.3 | | | |
| | 02 | 1.1-1.24 | Gsi | < .3 | .09 | < 3 | < 8 | 33.5 | 63.9 | 34.1 | | | |
| | | | | < .3 | .09 | < 3 | < 8 | 33.7 | 63.7 | 35.3 | | | |
| | 03 | 2.2-2.45 | Gsi | < .3 | .11 | < 3 | < 8 | 52.2 | 81.8 | 43.1 | | | |
| | | | | < .3 | .11 | < 3 | < 8 | 52.0 | 81.1 | 42.8 | | | |
| | 04 | 3.53-3.6 | Gsi | < .3 | .09 | < 3 | < 8 | 46.1 | 75.9 | 45.7 | | | |
| | | | | < .3 | .08 | < 3 | < 7 | 45.6 | 75.4 | 43.8 | | | |
| | 05 | 4.3-4.55 | Gsi | < .3 | .07 | < 3 | < 8 | 35.5 | 68.2 | 19.7 | | | |
| | | | | < .3 | .06 | < 3 | < 8 | 36.1 | 69.2 | 19.6 | | | |
| 69 | 01 | 0-.25 | Bo | 1.8 | .58 | 136 | < 8 | 146 | 450 | 60.9 | | | |
| | | | | 1.5 | .59 | 133 | < 8 | 140 | 448 | 62.8 | | | |
| | 02 | .52-.87 | Gsi | < .3 | .03 | < 3 | < 8 | 50.8 | 89.7 | 23.7 | | | |
| | 03 | 1.83-2.12 | Gsi | < .3 | .07 | < 3 | < 8 | 25.9 | 57.5 | 30.6 | | | |
| 70 | 01 | 0-.3 | Bo | < .3 | .56 | 61 | < 8 | 80 | 183 | 40.9 | | | |
| | 02 | .3-.56 | Gsi | < .3 | .49 | 52 | < 8 | 55.2 | 86.1 | 28.0 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 03 | .55-.8 | Brsisdsh | < .3 | .09 | 10 | < 8 | 25.9 | 51.5 | 24.3 | | | |
| | 04 | .8-1.1 | Gsi | < .3 | .06 | < 3 | < 8 | 23.2 | 50.1 | 21.0 | | | |
| 71 | 01 | 0 | Bo | 2.0 | 1.04 | 132 | < 8 | 73.1 | 177 | 27.4 | | | |
| | 02 | .3 | Bo | 0.8 | 1.01 | 168 | < 8 | 92.7 | 212 | 23.7 | | | |
| | 03 | .7 | si/sh | < .3 | .28 | 9 | < 8 | 16.2 | 31.5 | 21.3 | | | |
| | 04 | .9 | si/sd | < .3 | .32 | 7 | < 8 | 31.0 | 60.8 | 34.3 | | | |
| | 05 | 1.4 | si/sd | < .3 | .03 | 10 | < 8 | 37.9 | 69.3 | 36.3 | | | |
| | 06 | 1.7 | si/sd | < .3 | .06 | 3 | < 8 | 12.7 | 36.5 | 22.7 | | | |
| | 08 | 4.3 | si/sd | < .3 | .12 | < 3 | < 8 | 56.3 | 77.6 | 56.3 | | | |
| 72 | 01 | 0-0.15 | Bo | 1.3 | .89 | 129 | < 8 | 157 | 373 | 55.6 | | | |
| | | | | 1.3 | .85 | 131 | < 8 | 160 | 388 | 57.7 | | | |
| | 02 | 0.15-.30 | si/sd | < .3 | .12 | < 3 | < 8 | 29.0 | 58.6 | 28.3 | | | |
| | | | | < .3 | .14 | < 3 | < 7 | 28.4 | 58.6 | 28.6 | | | |
| | 03 | 2.7-2.9 | si/sd | < .3 | .14 | < 3 | < 8 | 49.6 | 74.7 | 39 | | | |
| | 04 | 3.65-3.9 | si/sd/y | < .3 | .13 | < 3 | < 8 | 47.9 | 71.9 | 38.5 | | | |
| | | | | < .3 | .09 | < 3 | < 8 | 51.5 | 87.6 | 24.8 | | | |
| | 05 | | Bo | < .3 | .23 | 32 | < 8 | 61.2 | 163 | 36.5 | | | |
| | | | | < .3 | .22 | 35 | < 8 | 63.8 | 170 | 37.2 | | | |
| 73 | 01 | 0-.25 | Bo (0.35 m) | < .3 | .44 | 133 | < 8 | 182 | 435 | 60.8 | | | |
| | 02 | .35-.5 | Brsi | < .3 | .11 | 9 | < 8 | 35.5 | 69.4 | 27.6 | | | |
| | 03 | 1.45-1.7 | Gsi | < .3 | .05 | < 3 | < 8 | 37.4 | 60.6 | 31.9 | | | |
| | | | | < .3 | .06 | < 3 | < 8 | 37.7 | 61.3 | 33.6 | | | |
| | 04 | 2.56-2.81 | Gsi | < .3 | .05 | < 3 | < 8 | 54.4 | 78.6 | 45.9 | | | |
| | 05 | 3.75-4.02 | Gsi | < .3 | .06 | < 3 | < 8 | 43.1 | 78.1 | 22.3 | | | |
| 74 | 01 | 0-.25 | Bo | < .3 | .49 | 143 | < 8 | 124 | 753 | 62.6 | | | |
| | 02 | .25-.50 | Gsi/sd | < .3 | .06 | < 3 | < 8 | 38.9 | 77.6 | 45.8 | | | |
| | 03 | .50-.85 | Gsi/sd | < .3 | .06 | < 3 | < 8 | 67.4 | 76.4 | 36.9 | | | |
| | 04 | .85-1.05 | Gsi/sd | < .3 | .06 | < 3 | < 8 | 57.7 | 82.8 | 31.5 | | | |
| 75 | 01 | 0-.20 | Bo | 0.6 | .36 | 41 | < 8 | 41.6 | 92.6 | 20.9 | < .02 | .002 | .002 |
| | | | | 0.6 | .48 | 42 | < 8 | 41.1 | 91.1 | 25.6 | | | |
| | 02 | .5 | si/sd | < .3 | .11 | < 3 | < 8 | 13.3 | 33.5 | 15.0 | < .02 | < .002 | .002 |
| | | | | < .3 | .12 | < 3 | < 8 | 13.3 | 36.7 | 15.3 | | | |
| 76 | 01 | 0-.35 | Bo (3.5 m) | 3.3 | .72 | 177 | < 8 | 145 | 514 | 65.7 | | | |
| | | | | 3.3 | .73 | 181 | < 8 | 184 | 515 | 65.0 | | | |
| | 02 | .8 | Gsi/sd | < .3 | .11 | < 3 | < 8 | 22.7 | 51 | 22.5 | | | |
| | | | | < .3 | .10 | < 3 | < 8 | 19.0 | 47.8 | 24.4 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | 01 | 0-.25 | Bo (0.7 m) | 1.3 | .56 | 89 | < 8 | 109 | 266 | 53.1 | < .02 | .003 | .005 |
| | 02 | .7-.94 | Brsi | < .3 | .08 | < 3 | < 8 | 44.9 | 76.6 | 45.5 | | | |
| | 03 | 1.1-1.25 | Gsi | < .3 | .08 | < 3 | < 8 | 54.1 | 89.8 | 24.2 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 52.7 | 90.5 | 25.0 | | | |
| 78 | 01 | 0-.20 | Bo (0.75 m) | .5 | .47 | 144 | 9 | 173 | 679 | 65 | | | |
| | 02 | .55-.7 | Bo | 2.7 | .51 | 128 | 14 | 107 | 445 | 50.7 | | | |
| | 03 | .95-1.20 | Gsi | < .3 | .07 | < 3 | < 8 | 25.5 | 63.7 | 32.0 | | | |
| | | | | < .3 | .06 | < 3 | < 8 | 22.7 | 61.4 | 27.5 | | | |
| 79 | 01 | 0-.22 | Bo | < .3 | 0.5 | 137 | < 8 | 153 | 884 | 67.7 | | | |
| | 02 | .22-.43 | Brsi | < .3 | .06 | < 3 | < 8 | 34.8 | 78.5 | 33.6 | | | |
| 80 | 01 | 0-.35 | Bo | < .3 | .08 | < 3 | < 8 | 17.2 | 52.3 | 20.9 | | | |
| | | | (0.5 m) | < .3 | .08 | 8 | < 8 | 18.0 | 48.7 | 21.9 | | | |
| | 02 | 0.6 | G sd/g | 0.8 | .37 | 130 | 13 | 120 | 333 | 40.8 | | | |
| | | | | 0.7 | .37 | 109 | < 8 | 129 | 330 | 42 | | | |
| 81 | 01 | 0 | Bo | 1.4 | .48 | 162 | 11 | 68.1 | 449 | 52.9 | | | |
| | 02 | .8 | si/sh | < .3 | .03 | < 3 | < 8 | 19.1 | 52.9 | 25.6 | | | |
| | 03 | 1.8 | si/sd/gr | < .3 | .08 | < 3 | < 8 | 35.4 | 75 | 38.7 | | | |
| 82 | 01 | 0-.3 | Bo (0.7 m) | < .3 | .24 | 102 | 10 | 119 | 290 | 47.3 | | | |
| | 02 | .72-1.02 | si/sd | < .3 | .16 | 24 | < 7 | 36.5 | 63.4 | 25.3 | | | |
| | 03 | 1.02-1.32 | Gsd | < .3 | .05 | < 3 | < 8 | 15.4 | 31.7 | 22.7 | | | |
| | | | | < .3 | .05 | < 3 | < 8 | 14.5 | 31.1 | 21.6 | | | |
| 83 | 01 | 0-.25 | Bo | < .3 | .49 | 156 | < 8 | 133 | 1330 | 66.9 | | | |
| | 02 | .25-.3 | Bo/sh | < .3 | .16 | 28 | < 8 | 56.2 | 272 | 33.8 | | | |
| | 03 | 1.1-1.25 | Brsi | < .3 | .05 | 3 | < 8 | 46.1 | 89.2 | 23.2 | | | |
| | 04 | | | < .3 | .03 | < 3 | < 8 | 31.2 | 83.4 | 23.6 | | | |
| 84 | 01 | 0-.37 | Bo/sh | 0.5 | .23 | 60 | < 8 | 99.2 | 158 | 24.6 | | | |
| | | | | 0.7 | .24 | 49 | < 8 | 102.0 | 138 | 20.3 | | | |
| | 02 | 1.25 | Gsi | < .3 | .06 | < 3 | < 8 | 15.4 | 40.7 | 18.1 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 22.4 | 41.8 | 18.9 | | | |
| | 02A | | | < .3 | .04 | < 3 | < 8 | 26.0 | 58.7 | 25.7 | < .02 | < .002 | .002 |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 86 | 01 | 0-.25 | Bo/sd/g | .4 | .48 | 152 | < 8 | 146 | 222 | 45.6 | | | |
| | | | | .5 | .42 | 168 | < 8 | 142 | 222 | 46.4 | | | |
| | 02 | .25-.50 | Gsd | < .3 | .06 | < 3 | < 8 | 18.4 | 37.8 | 18 | | | |
| | 03 | .8-1.05 | Gsd | < .3 | .06 | < 3 | < 8 | 28.5 | 54.1 | 23.9 | | | |
| 86 | 01 | 0-.3 | Bosi | < .3 | .27 | 141 | < 8 | 143 | 1330 | 52.2 | .07 | .010 | .017 |
| | 02 | .3-.5 | Bosi | < .3 | .84 | 188 | 18 | 132 | 3460 | 87.2 | | | |
| | 03 | .7-.9 | Gsd/si/g | < .3 | .07 | < 3 | < 8 | 22.9 | 75.3 | 27.3 | | | |
| 87 | 01 | .0 | Bo/sd/g/sh | 5.1 | 2.76 | 202 | < 8 | 239 | 1770 | 51.2 | | | |
| | 02 | .8 | si | < .3 | .35 | 135 | < 8 | 324 | 363 | 54.9 | | | |
| | 03 | 1.7 | si/sd | < .3 | .23 | 31 | < 8 | 31.0 | 61.7 | 30.9 | | | |
| 88 | 01 | .0-.25 | Bo | < .3 | .31 | 61 | < 8 | 49.1 | 271 | 29.3 | .09 | .002 | .007 |
| | 02 | .25-.55 | Gsd/g/si | < .3 | .09 | 4 | < 8 | 23.5 | 60.8 | 25.1 | | | |
| | 03 | .55-.8 | Gsd/g/si | < .3 | .08 | 4 | < 8 | 22.9 | 48.9 | 28.0 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 23.2 | 48.3 | 27.8 | | | |
| 89 | -- | .0-.5 | wd | - | - | - | - | - | - | - | | | |
| | 01 | 0.9 | si/sh | < .3 | .03 | < 3 | < 8 | 33.0 | 56.2 | 41.6 | | | |
| | 02 | 1.9 | si | < .3 | .03 | < 3 | < 8 | 30.4 | 58.0 | 23.6 | | | |
| 90 | 01 | .0-.3 | Bo | < .3 | .15 | 30 | 20 | 63.2 | 105 | 216 | 0.19 | .002 | .005 |
| | | | | < .3 | .16 | 25 | < 8 | 64.3 | 103 | 325 | | | |
| | 02 | .8 | si/sh | < .3 | .13 | < 3 | < 8 | 20.9 | 53.5 | 26.7 | < .02 | < .002 | .002 |
| | | | | < .3 | .12 | < 3 | < 8 | 21.2 | 51.7 | 25.7 | | | |
| 91 | 01 | .0-.15 | Gsd/sh | < .3 | 0.2 | 32 | < 8 | 139 | 91.8 | 22.1 | | | |
| | 02 | .15-.38 | Gsi/sd | < .3 | 0.1 | < 3 | < 8 | 27.7 | 59.3 | 29.2 | | | |
| | 03 | .38-.64 | Gsi/sd | < .3 | .09 | < 3 | < 8 | 24.6 | 55.4 | 29.2 | | | |
| | | | | < .3 | .08 | < 3 | < 8 | 27.6 | 56.9 | 31.2 | | | |
| | 04 | .64-.98 | Gsi/sd | < .3 | .11 | < 3 | < 8 | 27.0 | 56.9 | 30.2 | | | |
| 92 | 01 | 0-.3 | Bo | < .3 | .3 | 62 | < 8 | 128 | 189 | 38.2 | .02 | < .002 | .003 |
| | 02 | .3-.55 | g/sd | < .3 | .20 | 14 | < 8 | 48.7 | 61.4 | 20.1 | | | |
| | | | | < .3 | .19 | 13 | < 8 | 49.6 | 61.4 | 19.3 | | | |
| | 03 | .55-.80 | g/sd | < .3 | .08 | 4 | < 8 | 18.1 | 40.3 | 23.0 | | | |
| | Bag | approx. 1 m | si/Bo | < .3 | .1 | 14 | < 8 | 31.9 | 42.5 | 15.0 | | | |
| 93 | 01 | .0-.25 | Bo/sd/g | < .3 | .25 | 32 | < 8 | 69.7 | 107 | 28.2 | | | |
| | 02 | .25-.75 | Bo/sd | < .3 | .08 | < 3 | < 8 | 18.5 | 43.1 | 20.4 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 18.9 | 43.2 | 20.6 | | | |
| | 03 | .75+ | Brsi/ds/g | < .3 | .08 | < 3 | < 8 | 17.9 | 42.2 | 22.1 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 94 | 01 | .0-.2 | si/sd/sh/o | < .3 | .45 | 79 | < 8 | 171 | 224 | 38.6 | | | |
| | 02 | .2>-.5 | Gsi/sd/sh | < .3 | .30 | 26 | < 8 | 61.5 | 102 | 33.5 | | | |
| | | | | < .3 | .38 | 27 | < 8 | 58.9 | 99.3 | 33.9 | | | |
| | | | | < .3 | .09 | < 3 | < 8 | 43.5 | 78.6 | 28.1 | | | |
| 95 | 01 | .0-.35 | Gsd/g/sh | < .3 | .27 | 92 | < 8 | 79.1 | 175 | 27.4 | | | |
| | 02 | .35-.6 | sh/sd/g | < .3 | .21 | 6 | < 8 | 17.3 | 35.4 | 17.9 | | | |
| | 03 | 1.45-1.75 | Gsi/sd | < .3 | .08 | < 3 | < 8 | 45.1 | 71.9 | 37.4 | | | |
| | 04 | 2.35-2.65 | Gsi/sd | < .3 | .06 | < 3 | < 8 | 25.8 | 52.4 | 22.7 | | | |
| 96 | 01 | 0-.25 | Bo/sd | < .3 | .28 | 123 | < 8 | 122 | 322 | 44.8 | .05 | .005 | .017 |
| | | | | < .3 | .29 | 144 | < 8 | 124 | 324 | 45.4 | | | |
| | 02 | .25-.5 | Gsd | < .3 | .06 | 6 | < 8 | 11.3 | 24.4 | 12.2 | | | |
| | 03 | 1.05-1.35 | Brsi | .4 | .04 | < 3 | < 8 | 36.6 | 64.6 | 31.6 | | | |
| | 04 | 2.15-2.45 | Gsi | < .3 | .04 | < 3 | 26 | 30.7 | 55.6 | 30.1 | | | |
| | | | | < .3 | .04 | < 3 | 21 | 30.4 | 53.2 | 29.2 | | | |
| 97 | 01 | .0-.25 | Gsi | < .3 | .06 | < 3 | < 8 | 53.4 | 78.2 | 35.4 | | | |
| | 02 | .25-.5 | Gsi | < .3 | .05 | < 3 | < 8 | 55.8 | 87.2 | 24.9 | | | |
| | 03 | 2.3-2.5 | Gsi | < .3 | .05 | < 3 | < 8 | 48.4 | 86.1 | 23.3 | | | |
| | | | | < .3 | .05 | < 3 | < 8 | 48.8 | 85.9 | 23.9 | | | |
| | 04 | 3.5-3.75 | Gsd | < .3 | .06 | < 3 | < 8 | 28.6 | 55.7 | 21.5 | | | |
| | 05 | 3.75-4.0 | Gsd | < .3 | .14 | 41 | < 8 | 31.0 | 57.5 | 25.0 | | | |
| | 06 | 4.0-4.25 | Gsd | < .3 | .10 | 11 | < 8 | 26.0 | 51.4 | 27.0 | | | |
| | 07 | 4.25-4.5 | Gsd | < .3 | .07 | < 3 | < 8 | 17.3 | 35.5 | 22.5 | | | |
| | | | | < .3 | .07 | < 3 | < 8 | 16.7 | 35.4 | 24.1 | | | |
| 98 | 01 | .0-.85 | Bo | .8 | .87 | 244 | < 8 | 177 | 482 | 50.9 | | | |
| | 02 | .85-1.1 | Bo | 1.1 | .84 | 236 | < 8 | 152 | 473 | 49.8 | | | |
| | | | | .9 | .80 | 259 | < 8 | 152 | 474 | 50.0 | | | |
| | 03 | 1.1-1.4 | Gsi/sd/sh | < .3 | .09 | 48 | < 8 | 47.8 | 72.8 | 38.4 | | | |
| | 04 | 2.0-2.2 | si/sd/g | < .3 | .06 | < 3 | < 8 | 32.6 | 61.9 | 26.7 | | | |
| 99* | | Surface | Gsi | < .3 | .09 | < 3 | < 8 | 45.3 | 84.2 | 27.7 | | | |
| | | | | < .3 | | < 3 | < 8 | 46.4 | 89.0 | 27.5 | | | |
| 100 | Bag | .0-.5 | Gsi | < .3 | .09 | 7 | < 8 | 68.4 | 86.1 | 39.6 | | | |
| 101 | 01 | .0-.3 | Gsd/g/o | < .3 | .25 | 52 | < 8 | 106 | 152 | 33.7 | | | |
| | 02 | .3-.55 | sh/sd | < .3 | .08 | 4 | < 8 | 20.1 | 54.1 | 23.9 | | | |
| | 03 | .55-.85 | Gsi | < .3 | .07 | < 3 | < 8 | 46.3 | 91.1 | 31.6 | | | |

Continued...

TABLE 1 FALSE CREEK - SEDIMENT ANALYSIS RESULTS
SCHEDULE I & II SUBSTANCES
NOVEMBER - DECEMBER 1982
(Continued)

| STN | SUB-SAMPLE | DEPTH M | DESCRIPTION | Cd | Hg | Pb | As | Cu | Zn | Cr | PCB | TCP | PCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 01 | .0-.4 | Bo | < .3 | .47 | 127 | < 8 | 114 | 360 | 56.8 | | | |
| | 02 | .4-.6 | sh/sd | < .3 | .08 | 27 | < 8 | 22.1 | 59.5 | 18.3 | | | |
| | 03 | .6-.9 | sh/sd/g | < .3 | .11 | 5 | < 8 | 14.3 | 34.2 | 14.6 | | | |
| | 04 | .9-1.25 | Gsi | < .3 | .08 | < 3 | < 8 | 48.1 | 75.4 | 44.1 | | | |
| 103 | 01 | .0-.30 | Gsd/sh/Bo | < .3 | .12 | 1950 | < 8 | 30.7 | 77.1 | 22.3 | | | |
| | 02 | .3-.55 | Gsd/sh/si | .9 | .06 | 13 | < 8 | 13.8 | 28.8 | 11.6 | | | |
| | | | | .8 | .05 | 4 | < 8 | 13.8 | 28.6 | 12.5 | | | |
| | 03 | 1.1-1.35 | Gsi | < .3 | .07 | < 3 | < 8 | 47.7 | 79.3 | 44.5 | | | |
| | 04 | 1.55-1.8 | Gsi | < .3 | .04 | < 3 | < 8 | 25.0 | 53.6 | 24.7 | | | |
| 104 | 01 | .0-.15 | Bo | .4 | .98 | 125 | < 8 | 140 | 422 | 57.0 | .23 | .021 | .032 |
| | | | | < .3 | 1.03 | 122 | < 8 | 142 | 416 | 58.1 | | | |
| | 02 | .15-.42 | Gsi/sd | < .3 | .08 | < 3 | < 8 | 21.6 | 46.1 | 19.5 | < .02 | < .002 | .002 |
| 105 | 01 | .0-.3 | Gsd/Bo/si/sh | < .3 | .28 | 44 | < 8 | 50.1 | 136 | 27.6 | | | |
| | 02 | .3-.55 | Gsd/Bo/si/sh | < .3 | .05 | < 3 | < 8 | 10.4 | 36.6 | 23.9 | | | |
| | | | | < .3 | .04 | < 3 | < 8 | 10.9 | 35.4 | 20.0 | | | |
| | 03 | .55-.8 | Gsi | < .3 | .05 | < 3 | < 8 | 33.5 | 69 | 28.1 | | | |
| | 04 | .8-1.05 | Gsi | < .3 | .05 | < 3 | < 8 | 35.5 | 72.6 | 29.8 | | | |
| 106 | 01 | 0-.25 | Bo | < .3 | .15 | 56 | < 8 | 58.1 | 161 | 26.5 | | | |
| | | | | < .3 | .15 | 52 | < 8 | 58.1 | 163 | 28.6 | | | |
| | 02 | .25-.55 | Bo | .5 | .42 | 143 | < 8 | 120.0 | 377 | 49.5 | | | |
| | 03 | .55-.80 | Gsd/sh | < .3 | .05 | < 3 | < 8 | 21.2 | 54.1 | 23.4 | | | |
| | 04 | .80-1.05 | Brsi/sd | < .3 | .04 | < 3 | < 8 | 25.9 | 58.6 | 27.2 | | | |
| | | | | < .3 | .04 | < 3 | < 8 | 24.9 | 58.8 | 29.3 | | | |
| 107 | Bag | Surface | sd/g/sh | < .3 | .15 | 22 | < 8 | 33.5 | 76.2 | 24.5 | | | |
| 108 | 01 | .0-.56 | Bo/sd/si | < .3 | .19 | 45 | < 8 | 53.5 | 119 | 35.3 | | | |
| | 02 | .56-.86 | Gsd | < .3 | .15 | 12 | < 8 | 37.2 | 79.3 | 32.5 | | | |
| 109 | 01 | .0-.3 | Bo | < .3 | .40 | 61 | < 7 | 89.0 | 230 | 41.4 | | | |
| | | | | < .3 | .41 | 59 | < 8 | 95.0 | 234 | 41.3 | | | |
| | 02 | .3-.9 | Gsi/sd | < .3 | .06 | < 3 | < 8 | 38.1 | 76.3 | 25.5 | | | |
| 110 | 01 | .0-.25 | Brsi/sd/sh | < .3 | .11 | < 3 | < 8 | 28.5 | 63.1 | 29.3 | < .02 | < .002 | < .002 |
| | 02 | .25-.50 | yr/sd | < .3 | .15 | < 3 | < 7 | 19.6 | 48.7 | 26.5 | | | |
| | | | | < .3 | .18 | < 3 | < 8 | 19.0 | 49.4 | 24.7 | | | |
| | 03 | .50-.80 | Gsi | < .3 | .09 | < 3 | < 8 | 26.8 | 54.5 | 30.8 | | | |
| | 04 | 1.4-1.7 | Gsi | < .3 | .1 | < 3 | < 8 | 43.8 | 73.5 | 27.4 | | | |

TABLE 2 REFERENCE SEDIMENTS

MESS-1 Marine Sediment (ug/g)

| DATE | Cd | Pb | As | Cu | Zn | Cr |
|---|---|---|---|---|---|---|
| Dec. 2/82 | < 0.50 | 28.0 | < 10 | 27.0 | 178 | 34.0 |
| Dec. 3/82 | < 0.50 | 28.0 | < 10 | 27.0 | 181 | 33.0 |
| Dec. 16/82 | < 0.50 | 26.0 | < 10 | 24.0 | 184 | 32.0 |
| Dec. 16/82 | < 0.50 | 26.0 | < 10 | 26.0 | 182 | 33.0 |
| Dec. 21/82 | < 0.50 | 25.0 | < 10 | 27.0 | 186 | 32.0 |
| Dec. 23/82 | < 0.40 | 26.0 | < 10 | 24.0 | 183 | 34.0 |
| Jan. 4/83 | < 0.50 | 29.0 | < 10 | 28.0 | 187 | 33.0 |
| NRC Value | 0.59±.1 | 34.0±6.1 | 10.6±.02 | 25.1±3.8 | 191±17 | 71±11 |

BSSS-1 Marine Sediment (ug/g)

| DATE | Cd | Pb | As | Cu | Zn | Cr |
|---|---|---|---|---|---|---|
| Dec. 2/82 | < 0.40 | 21.0 | < 10 | 19.0 | 124 | 66.0 |
| Dec. 3/82 | < 0.40 | 15.0 | < 10 | 17.0 | 112 | 56.0 |
| Dec. 16/82 | < 0.40 | 18.0 | < 10 | 17.0 | 111 | 57.0 |
| Dec. 16/82 | < 0.40 | 16.0 | < 10 | 17.0 | 109 | 55.0 |
| Dec. 21/82 | < 0.40 | 14.0 | < 10 | 17.0 | 111 | 54.0 |
| Dec. 23/82 | < 0.50 | 15.0 | < 10 | 17.0 | 105 | 53.0 |
| Jan. 4/83 | < 0.40 | 17.0 | < 10 | 17.0 | 107 | 56.0 |
| NRC Value | .25±.04 | 22.7±3.4 | 11.1±1.4 | 1.85±2.7 | 119±12 | 123±14 |

TABLE 2 REFERENCE SEDIMENTS (Continued)

MESS-1 Marine Sediment (ug/g)

| DATE | Hg |
|---|---|
| Dec. 16/82 | 0.21 |
| Dec. 23/82 | 0.17 |
| Jan. 7/83 | 0.21 |
| Jan. 10/83 | 0.20 |
| Jan. 10/83 | 0.21 |
| NRC Value | 0.17±0.01 |

BSSS-1 Marine Sediment (ug/g)

| DATE | Hg |
|---|---|
| Dec. 16/82 | 0.15 |
| Dec. 23/82 | 0.12 |
| Jan. 7/83 | 0.24 |
| Jan. 10/83 | 0.23 |
| Jan. 10/83 | 0.24 |
| NRC Value | 0.13±0.01 |

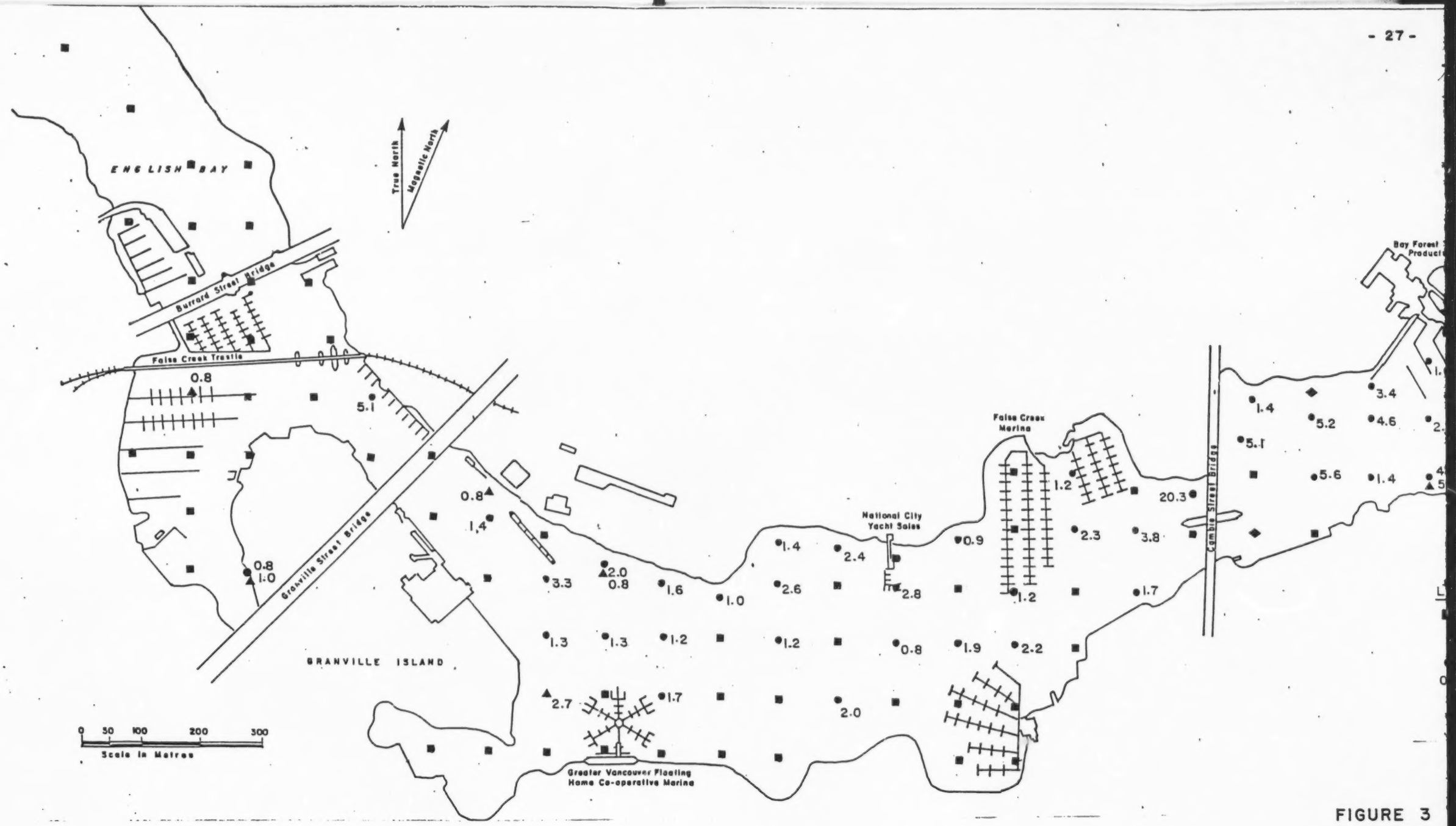



FIGURE 3
CADMIUM C
SEDIMENTS
REGULATE

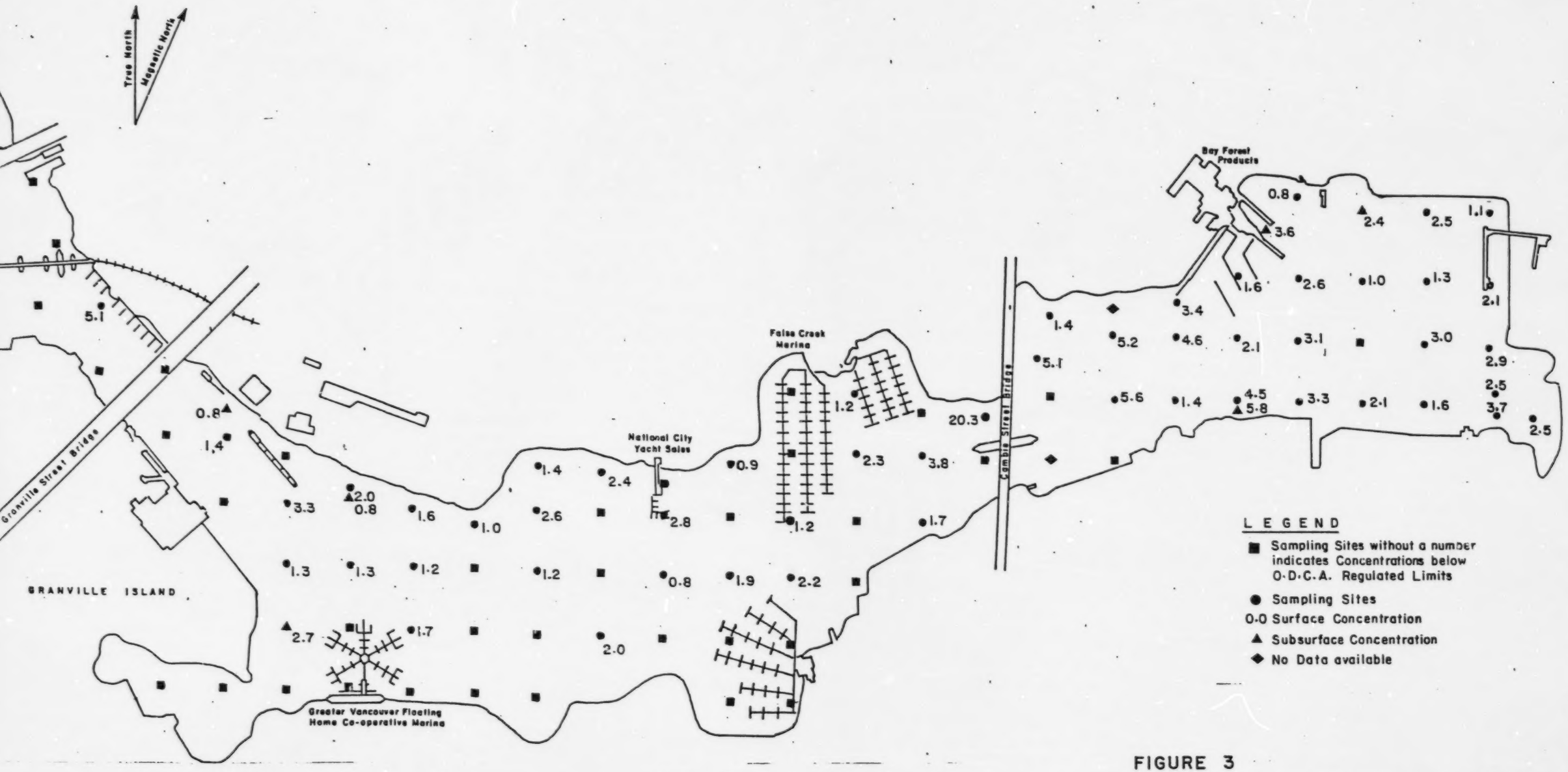
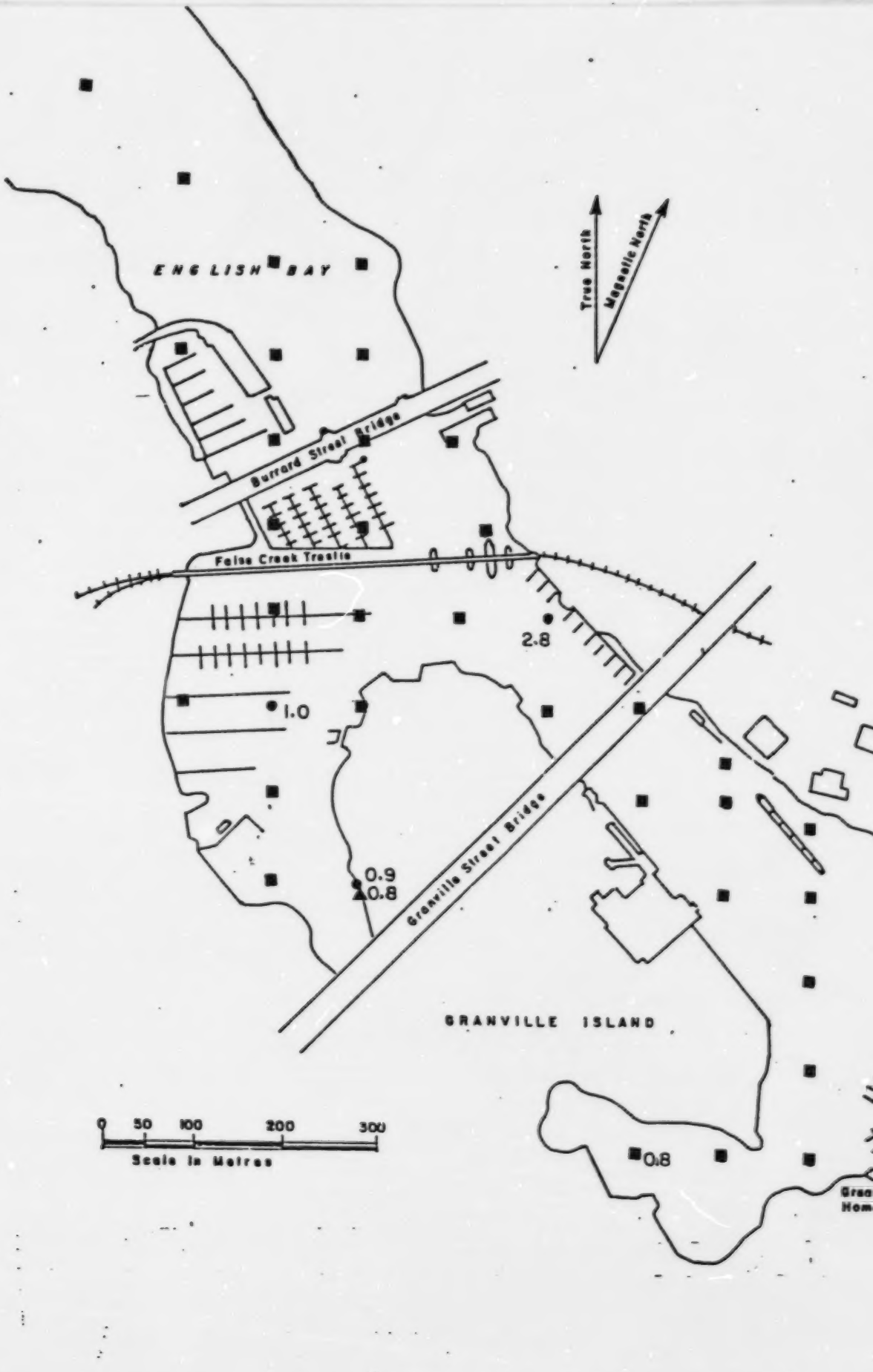



FIGURE 3

CADMIUM CONCENTRATIONS IN BENTHIC SEDIMENTS IN EXCESS OF O.D.C.A. REGULATED LIMITS


ENGLISH BAY
True North
Magnetic North
Burrard Street Bridge
False Creek Trestle
2.8
1.0
0.9
0.8
Granville Street Bridge
GRANVILLE ISLAND
0.8
0 50 100 200 300
Scale in Metres

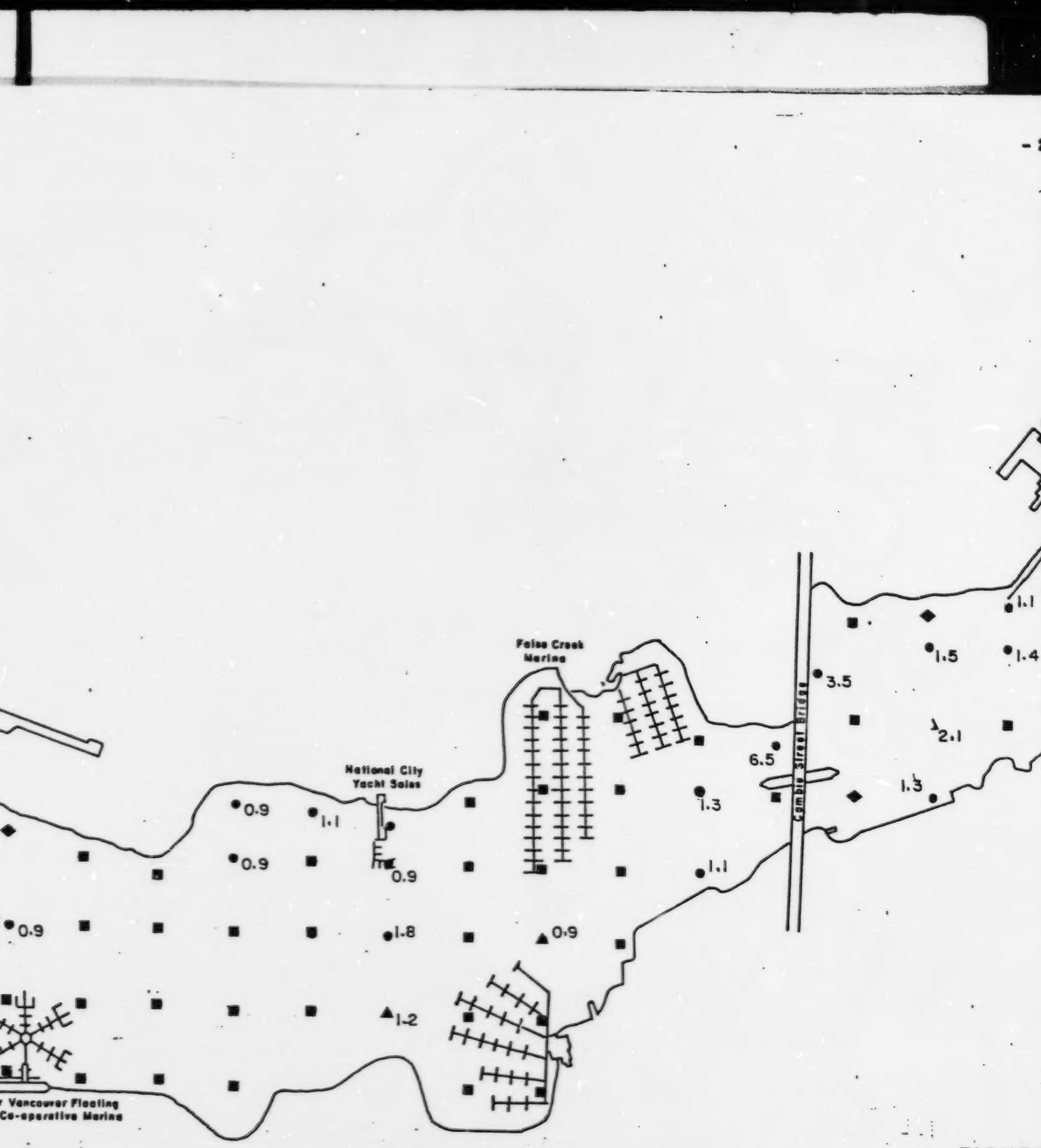



FIGURE
MERCU
SEDIM
REGUL

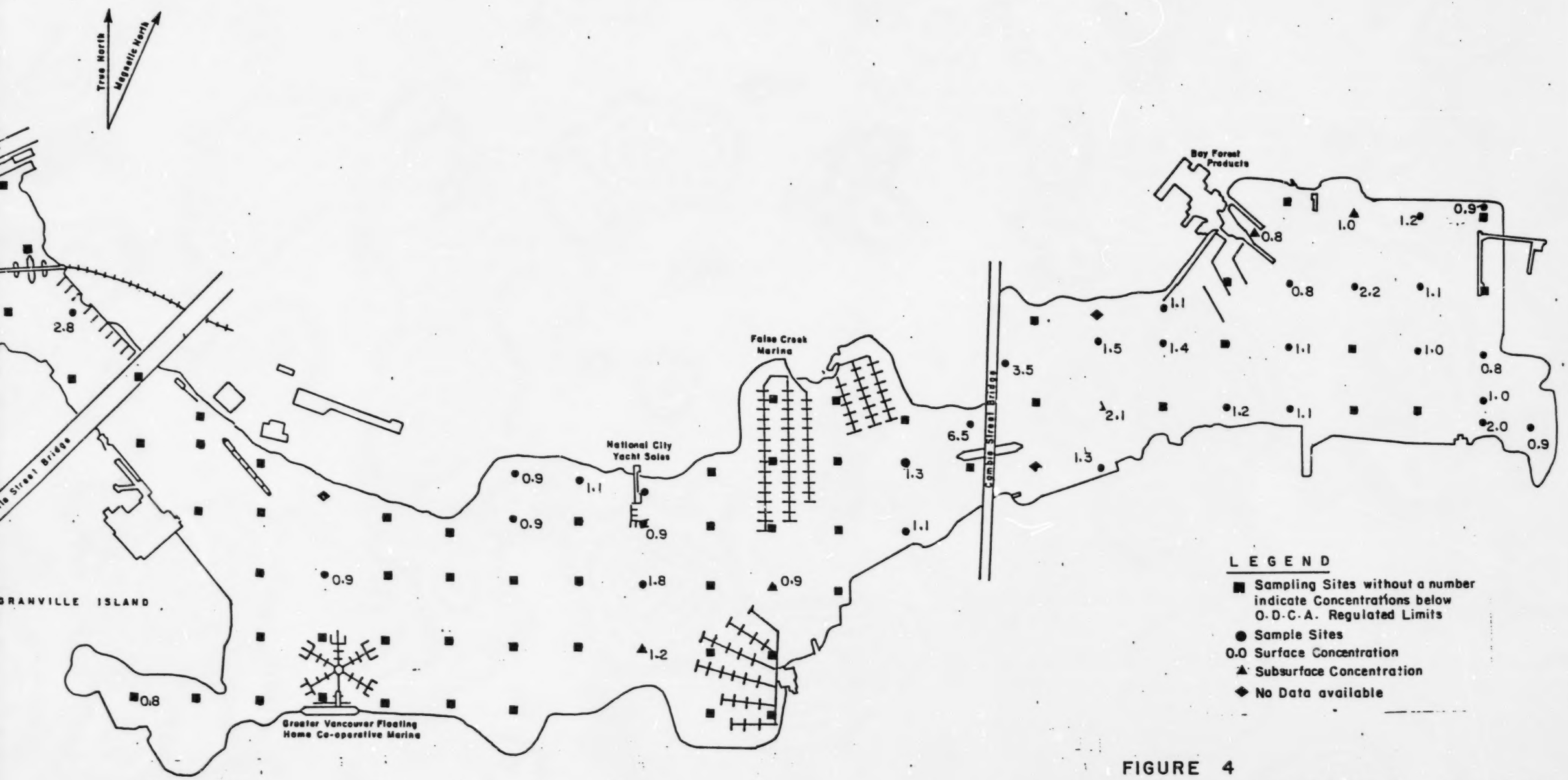



FIGURE 4
MERCURY CONCENTRATIONS IN BENTHIC SEDIMENTS IN EXCESS OF O.D.C.A. REGULATED LIMITS

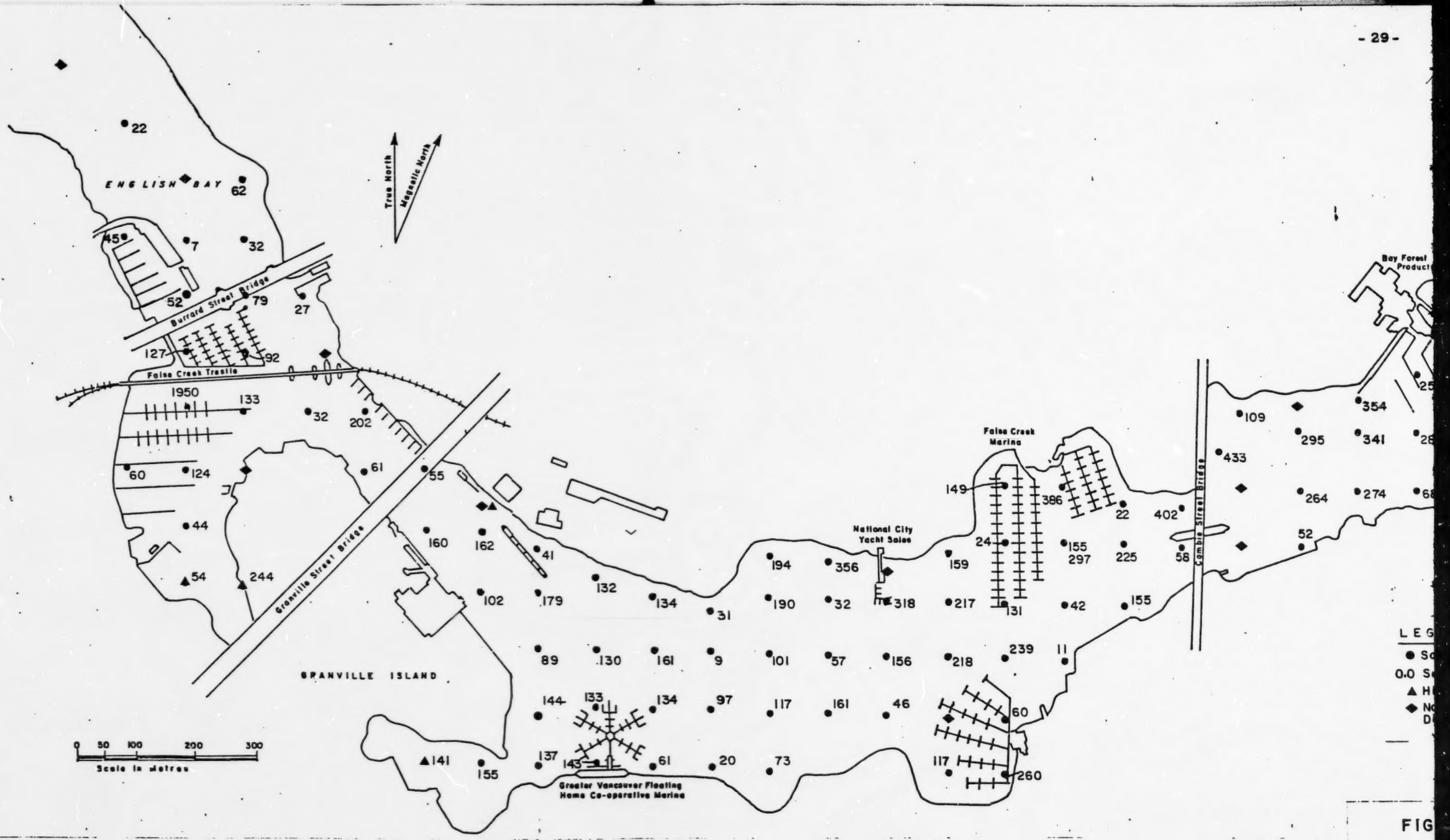

ENGLISH BAY
22
62
45
7
32
52
79
27
Burrard Street Bridge
127
92
False Creek Trestle
1950
133
32
202
60
124
61
55
44
54
244
Granville Street Bridge
160
162
41
102
179
132
134
31
194
356
190
32
318
89
130
161
9
101
57
156
144
133
134
97
117
161
46
141
155
137
143
61
20
73
GRANVILLE ISLAND
True North
Magnetic North
0 50 100 200 300
Scale in Metres
Granville Island Public Market
False Creek Marina
National City Yacht Sales
Greater Vancouver Floating Home Co-operative Marina
Bay Forest Product
109
354
295
341
433
264
274
149
386
22
402
24
155
297
225
58
159
217
131
42
155
52
239
11
60
117
260
Cambie Street Bridge

FIG
LEA
IN

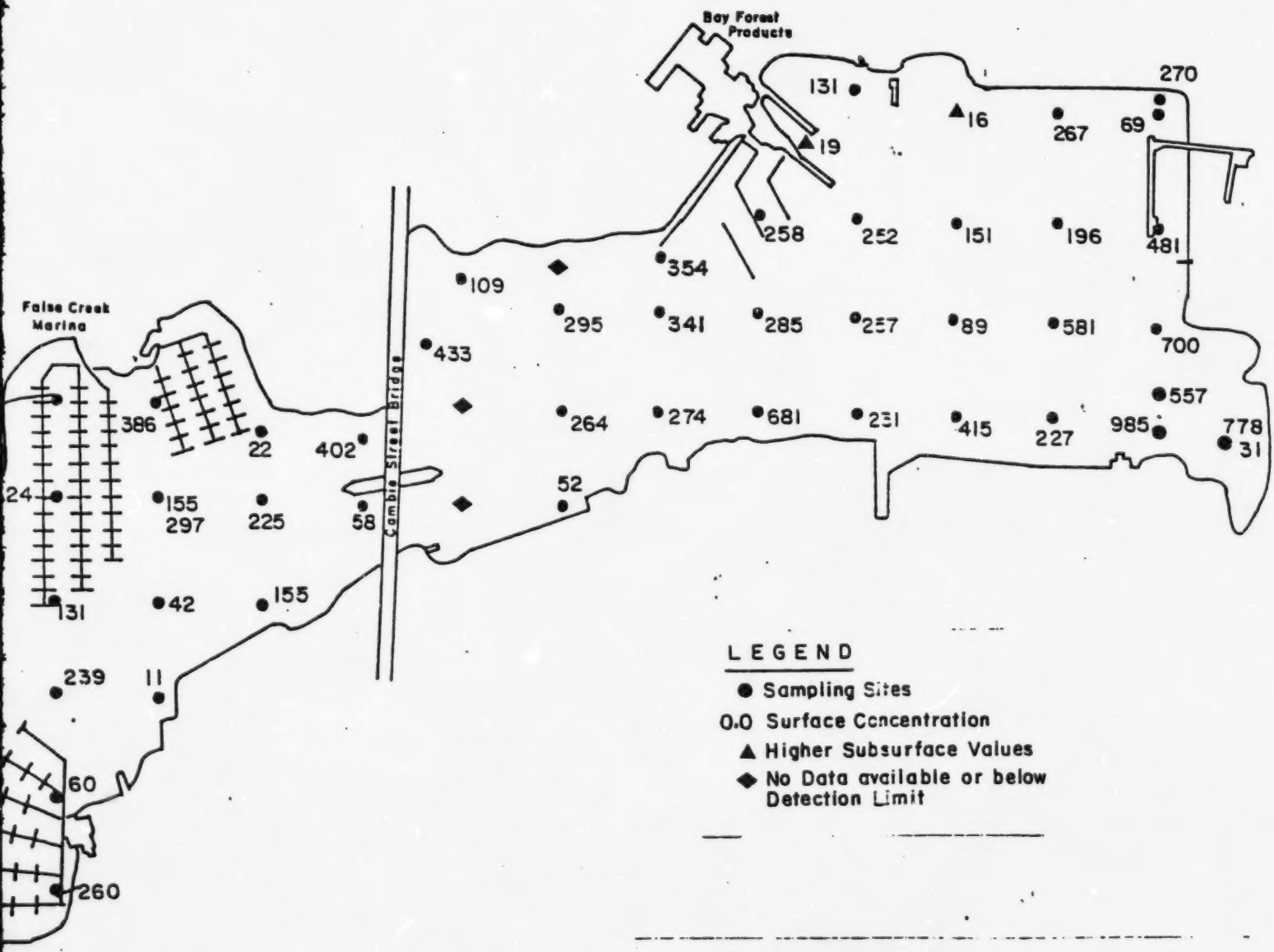



FIGURE 5
LEAD CONCENTRATIONS
IN BENTHIC SEDIMENTS

## REFERENCES

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3. Willis, Cunliffe, and Tait-DeLCan, Marine Environmental Investigation of the Imperial Group False Creek Site, report for the Imperial Group, Richmond, B.C., March 1982.

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# APPENDIX I

## CADMIUM CONCENTRATIONS/COLOUR RELATIONSHIPS

The following figure depicts the relationship between the sediment colour, as recorded at sampling time, and the concentration of cadmium determined by laboratory analysis of samples collected during this survey. All data can be found in Table 1.

The ODCA regulated concentration of cadmium, 0.6 mg/kg, is marked to illustrate the percentage of sediments which would be allowed or disallowed for standard ocean disposal practices. The premise that grey sediments can be judged not to contain cadmium concentrations over ODCA regulated limits in most cases can be clearly seen.

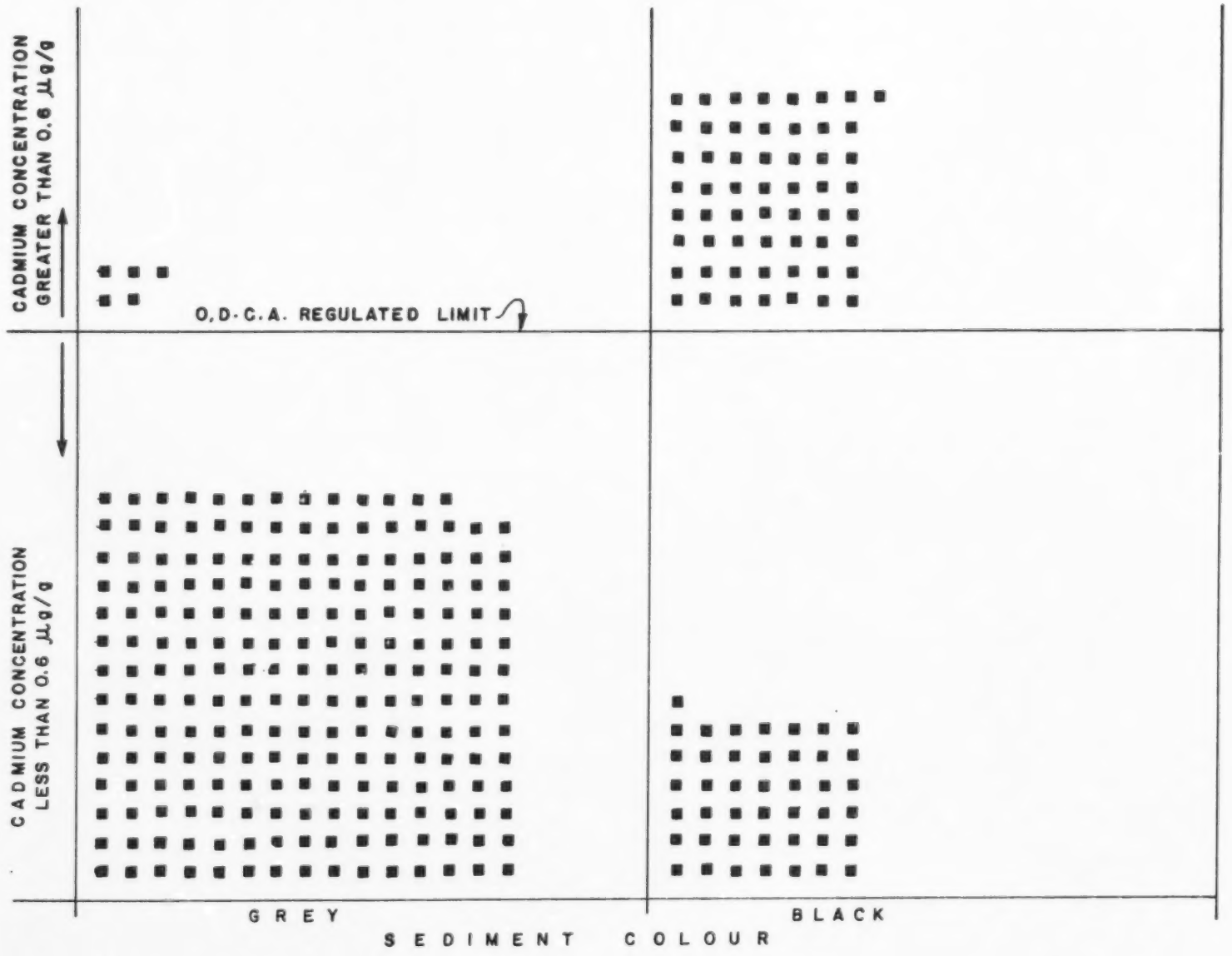


FIGURE 6 FALSE CREEK SEDIMENT SURVEY, 1982 - CADMIUM CONCENTRATION - SEDIMENT COLOUR RELATIONSHIP

# APPENDIX II

## TRACE METAL ANALYTICAL PROCEDURES

Sediments - Trace Metals

SAMPLE PREPARATION PROCEDURE

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SCOPE AND APPLICATION

This method (Aqua regia leach) is applicable to the decomposition of sediments prior to sample analysis.

SAMPLE CONDITION

The sample should be preserved (Code 231) and prepared (Codes 236, 238) (attached). Approximately 3 to 5 g are required to analyze the sample in duplicate.

METHOD PRINCIPLE

This technique may be classed as a leach or partial extraction. It will attack the crystal lattice to various degrees depending on the sample composition. Metals from pollution sources, most sulfides and organo-metalic compounds will be included in the extract.

The advantage of using a partial extraction over a total silica destruction technique, besides the shorter analysis time, is that small but environmentally significant metal concentrations can be more often be distinguished from the background concentration. Small concentration changes due to man's activities may be indistinguishable against a much larger background due to the total disolution of the primordial material.

INTERFERENCES

1. Any decomposition of sediments results in a solution containing a large variety of ions at trace to percent levels. Such a complex matrix invariably leads to problems during analysis.

APPARATUS

1. Calibrated, 50-ml test tubes with glass stoppers.
2. Aluminum hot block with holes to accomodate the test tubes and dimensioned to fit a hot plate.
3. Hot plate.
4. Balance readable to 0.001 g.

REAGENTS

1. Hydrochloric acid, concentrated, reagent grade.
2. Nitric acid, concentrated, reagent grade.

PROCEDURE

1. Weight 0.4 to 0.5 g of freeze dried, sieved sample into a 50-ml test tube.
2. Add approximately 5 ml of deionized water, 4.5 ml of HCl and 1.5 ml $HNO_3$.
3. Place the tube on the hot block and heat the sample on a low heat for 3 hours. If the sample froths or bumps violently, the heat is too high.
4. Cool and dilute with deionized water to the 50 ml mark.
5. Stopper and shake well. Allow the sample to sit overnight.
6. Carefully decant the clear supernatant into a clean, acid-washed plastic bottle. Discard the residue.

CALCULATIONS

There are no calculations but the following data is recorded:

1. Tube number.
2. Sample weight (g).

PROCEDURE

Analyse sample solutions by Inductively Coupled Argon Plasma (ICAP). Calculations of final results on computer program.

Sediments - Mercury

## SAMPLE PREPARATION PROCEDURES

### SCOPE AND APPLICATION

This method is applicable to the determination of mercury in marine sediments, fish tissues, shellfish, crustaceans and other fresh water and marine biota. The range is from 0.07 ug/g dry weight or 0.013 ug/g wet weight based on a sample size of 0.15 g dry and, 0.75 g wet weight, respectively.

### SAMPLE CONDITION

The sample should be preserved (Code 231) and prepared (Codes 236, 238) (attached). Approximately 3 to 5 g. are required to analyze the sample in duplicate.

### METHOD PRINCIPLE

The dried, sieved sample is digested with 4 + 1 sulfuric acid, and 50% $H_2O_2$. This oxidation will decompose inorganic mercury compounds (sulfides included) and organo-mercury complexes. Potassium permanganate is used as an auxillary oxidant. After oxidation the mercury is reduced by stannous chloride and hydrazine sulfate to elemental mercury and determined as described for mercury in water.

### INTERFERENCES

1. Without a drying tube, water can condense on the absorption cell windows. If the apparatus, reagents and samples are at room temperature, and the cell is constantly purged between samples, condenstation does not occur.

2. Low mercury recoveries usually indicate an incomplete digestion, most often as a result of using too much sample. Reduce the sample size and analyze again.

APPARATUS

1. Reaction tubes
   These tubes are 100-ml, Pyrex brand, "Student" graduated cylinders without the plastic base and truncated at the 100 ml mark.
2. Hot block and hot plate.
3. Flameless system.
4. Atomic absorption spectrophotometer capable of simultaneous background correction (Jarell Ash 810).

REAGENTS

All the reagents used are of analytical reagent grade. Deionized water is used throughout reagent preparation.

1. Sulfuric acid solution, 4+1:
   Four parts of concentrated $H_2SO_4$ are added to one part of water. Cool before use.
2. Hydrogen peroxide, 50% V/V:
   This reagent is tested for the presence of mercury in the following manner. To 4 ml of $H_2SO_2$ add 45 ml of water, cover and leave overnight. Add ten ml 4+1 $H_2SO_4$ and 1 ml 5% w/V $KMnO_4$. Prepare a similar blank with water instead of 50% $H_2O_2$. Both blanks are then analyzed in the usual manner. At twice the peroxide concentration used in the digestion, no detectable difference between the blanks has been found.
3. Potassium permanganate, 0.1% w/V:
   Dissolve 1 g of $KMnO_4$ in 1 litre of water and refirgerate before use. As the main potential source of mercury contamination, this reagent may contain mercury itself or may extract it from container walls and/or air [4].
4. Reducing solution, 2% w/V hydroxylamine sulfate, 1% w/V hydrazine sulfate, 3% w/V stannous chloride:
   Dissolve 10 g of $(NH_2OH)_2.H_2SO_4$ by stirring in 30 ml of water. Add 5 g of $H_2NNH_2.H_2SO_4$, stir until dissolved. Add 15 g of $SnCl_2.2H_2O$ and dissolve. The entire solution is then diluted to 500 ml with water (Note 4).

REAGENTS (continued)

5. Mercury standards, 0.01 to 0.5 ug:
   Prepare 0.10, 1.0 and 10.0 ug/ml Hg standards from a 1000 mg/l stock solution. From these standards prepare a working range by pipeting appropriate volumes into the reaction tubes.

| Concentration of Standard (ug/ml) | Volume Used (ml) | Resulting Hg Weight (ug) |
|---|---|---|
| 0 | 0 | 0 |
| 0.01 | 0.10 | 0.01 |
| 1.0 | 0.05 | 0.05 |
| 1.0 | 0.10 | 0.10 |
| 1.0 | 0.20 | 0.20 |
| 1.0 | 0.30 | 0.30 |
| 1.0 | 0.40 | 0.40 |
| 10.0 | 0.05 | 0.05 |

   Using the tube graduations, dilute to 10.0 ml with deionized water. Add 10.0 ml of 4+1, $H_2SO_4$+$H_2O$, swirl and cool. Add 40.0 ml of 0.1% w/V $KMnO_4$ forcefully to facilitate mixing. Cover and analyze as with sample procedure.

PROCEDURE

1. Weigh approximately 0.075 g of freeze-dried sample into a 100-ml reaction tube. Prepare a duplicate and record the vial number, tube number and sample weight.
2. Add 10.0 ml of 4+1, $H_2SO_4$+$H_2O$ solution in a constant stream, cover and leave overnight.
3. Add 4.0 ml of 50% $H_2O_2$ swirl and place the tube on the hot block.
4. Switch the hotplate to 5 (Corning PC100) and heat the tubes until the solution turns colorless (Note 5) and the bubbling stops (approximately 1-1.25 hours).

PROCEDURE (continued)

5. Remove the tubes from the block, cool them in a cold water bath and add 30.0 ml of cole 0.1% $KMnO_4$. The final volume should be 50.0 ml.
6. Adjust the instrument as per the manufacturer's instructions. Mercury absorbance is measured at 253.7 nm, and background absorbance is measured at 254.7 nm using a tin hollow cathode lamp.
7. Set the argon flow at 40 ml/min (5 on the flow meter) and switch the flow to the gas dispersion tube (Note 6).
8. Place a reaction tube on the apparatus and inject forcefully 5.0 ml of the reducing solution.
9. When the maximum peak height has been obtained, remove the tube and switch the argon flow to purge.
10. Switch the argon flow to the dispersion tube, put on the next tube and repeat the process (Note 7).

NOTES

1. No loss of mercury has been associated with this procedure [5, 6].
2. The use of argon as a sweep gas eliminated potential mercury contamination and increased absorbance by 25% [7].
3. An open flameless system is used rather than a closed system which requries a time consuming summation of absorbance peaks [8] and suffers from reproducibility problems [9].
4. Hydroxylamine sulfate destroys excess permanganate and manganese oxide. Hydrazine sulfate accelerates the reaction of stannous chloride [10].
5. If the tubes are left too long on the hot block, the solution becomes colored slightly, however, the effect on the accuracy of the results is negligible.
6. This flow was determined empirically to obtain maximum absorbance. If the cell and tubing are changed radically, the optimum flow rate must be determined.

NOTES (continued)

7. Tests showed that waiting for a return to baseline between samples was not necessary and rinsing the gas dispersion tube between samples was not necessary as carry-over was not detectable in either case.

CALCULATIONS

1. Draw a standard curve of ug/Hg vs absorbance.

2. Wet/Dry Ratio = $\frac{\text{weight before freeze drying (g)}}{\text{weight after freeze drying (g)}}$

3. ug/g dry weight Hg = $\frac{\text{ug Hg from curve}}{\text{dry weight in tube (g)}}$

4. ug/g wet weight = (ug/g dry weight Hg) (wet/dry ratio)

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Sediments - Trace Metals

PRESERVATION (231) - PREPARATION (236, 238)

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SCOPE AND APPLICATION

These methods are used to prepare sediments, soils and sludges prior to decomposition and metal determination.

SAMPLE CONDITION

Collect a representative sample (Note 1), drain off excess water, place the sample in a plastic bottle or whirl-pak bag and freeze.

METHOD PRINCIPLE

The sample is freeze dried and sieved using a 100 mesh (.150 mm) stainless steel sieve. The 100 mesh fraction includes the principle "adsorbers" of metals (clays, hydrous oxides and fine quartz) and particles which are small enough to be ingested by benthic biota.

INTERFERENCES

1. Metallic volatilization during freeze drying is possible but is not conclusive. Much depends (to an unknown extent) on the sample composition, metals present and their binding or adsorption characteristics.
2. The sieve must be composed of stainless steel as opposed to brass (Cu contamination) or plastic (mesh opens out and wears quickly).

APPARATUS

1. Freeze drying, apparatus.
2. Stainless steel sieves, 100 mesh.
3. Acid washed plastic vials and bottles.

REAGENTS

1. Deionized water.
2. Hydrochloric Acid, 1 + 10:
   Add 1 part of concentrated HCl to 10 parts of deionized water.

PROCEDURE

1. Soak all plastic vials, bottles and caps in 1 + 10 HCl for at least 24 hours. Rinse 3 times with deionized water and dry.
2. Set up the freeze dryer as per manufacturer's instructions. Place the bags or bottles containing the samples in the freeze dryer. Open the bag or bottle to allow the water to escape.
3. Dry the samples for 48 hours or more until dry.
4. Sieve each sample using the 100 mesh sieve and bottom pan.
5. Place the sieved portion in a clean plastic vial.
6. Clean the sieve with a brush and/or a dry cloth.

NOTES

1. The amount of sample required to be representative is dependent on the sample location. The amount of sample required for metal determination is approximately 2 g dry weight. The analysis is performed on a 100 mesh fraction. Therefore, samples composed mainly of course material necessitate a greater sample size to obtain enough 100 mesh fines for analysis.

CALCULATIONS

There are no calculations but the following data is recorded:

1. Sample number.
2. Vial number.

# APPENDIX III

## ORGANIC ANALYTICAL PROCEDURES

ENVIRONMENTAL LABORATORY
MINISTRY OF ENVIRONMENT

DRAFT PROCEDURE
February 1984

1. TITLE: PCB's and Chlorinated Phenols in Sediment

2. WORK ROUTE: To be assigned.

3. SCOPE AND APPLICATION

3.1 This method is applicable to the determination of Polychlorinated Biphenyls and Chlorinated Phenols in sediment.

3.2

| Parm # | Parameter Name | Lower Limit |
|---|---|---|
| A17 | Arochlor 1242 | 0.02 ug/g |
| A21 | Arochlor 1254 | 0.02 ug/g |
| A22 | Arochlor 1260 | 0.02 ug/g |
| T17 | 2, 3, 4, 5-Tetrachlorophenol | 0.002 ug/g |
| T19 | 2, 3, 5, 6-Tetrachlorophenol | 0.002 ug/g |
| P22 | Pentachlorophenol | 0.002 ug/g |

4. PRINCIPLE OF METHOD

4.1 A portion of sediment is digested with hydrochloric acid and extracted with methylene chloride. The phenols in the extract are separated by back-extraction with sodium hydroxide solution and the PCB's remaining in the extract are concentrated, cleaned up by column chromatography and analysed by gas-liquid chromatography/electron capture detector.

The sodium hydroxide solution is acidified, the phenols extracted with methylene chloride, concentrated, methylated, cleaned up by

column chromatography and analysed as anisoles by gas liquid chromatography/electron capture detector.

5. INTERFERENCES

5.1 Most co-extracting interfering compounds can be removed by column chromatography utilizing Florisil and/or silicic acid of appropriate activity. Sulfur commonly exists in sediments and can be removed using elemental mercury to produce mercuric sulfide which is not soluble in the organic solvents used.

6. APPARATUS AND MATERIALS

6.1 Gas liquid chromatograph: A GLC equipped with electron capture detector and analytical column(s) of suitable polarity e.g. 3% OV-17 or 4% OV-101/6% OV-210.

6.2 Normal laboratory glassware including 500 mL and 250 mL separatory flasks; 20 mL screw cap test tubes with teflon cap liners; 250 mL round bottom evaporation flasks, etc.

7. REAGENTS

7.1 Methylene chloride, pesticide grade.

7.2 Petroleum ether, pesticide grade.

7.3 Iso octane (2,2,4 Trimethylpentane), pesticide grade.

7.4 1% Aqueous sodium hydroxide solution.

7.5 Diazomethane (generated from N-methyl-N-nitroso urea)

7.6 Hydrochloric acid conc. reagent grade.

7.7 Sulfuric acid conc. reagent grade.

7.8 Sodium sulfate - anhydrous.

7.9 Florisil, PR grade, deactivated with 1% water.

7.10 Silicic acid, deactivated with 1% water.

7.11 Elemental mercury - reagent grade.

8. PROCEDURE

8.1 Place 10.0 g of the sediment in a 20 mL screw capped test tube and add 5 mL conc. HCl.

8.2 Heat on a steam bath at 60°C for 1 hour.

8.3 Transfer, with rinsing, to a 250 mL separatory funnel and extract with 25 mL $CH_2Cl_2$ three times and discard sediment and aqueous phase.

8.4 Back extract the combined $CH_2Cl_2$ with 50 mL 1% NaOH three times saving both phases and combining NaOH extracts.

8.5 Concentrate the $CH_2Cl_2$ phase from 8.4, add 4 mL Iso-octane and remove the $CH_2Cl_2$ by rotovap distillation.

8.6 Elute the iso-octane solution from 8.5 on 10 g. 1% deactivated Florisil with 100 mL Petroleum ether.

8.7 Rotovap to remove the petroleum ether, make up to suitable volume with iso-octane for GLC analysis (10 mL allows a lower limit of 0.02 ug/g).

8.8 Acidify the aqueous phase from 8.4 to pH 2. with conc. $H_2SO_4$ and extract with 50 mL $CH_2Cl_2$ three times, combining the extracts through $Na_2SO_4$ in a 250 mL round bottom flask.

8.9 Concentrate to < 5 mL and methylate by bubbling generated Diazomethane through the solution until a distinct yellow colour is produced. Let stand for 1/2 hour.

8.10 Remove excess diazomethane by blowing with high purity nitrogen, add 4 mL iso-octane and rotovap to remove $CH_2Cl_2$.
**NOTE: Use a proper fume hood for all operations involving iazomethane!**

8.11 Elute the iso-octane solution from 8.10 on a column of 5 g of 1% deactivated Florisil using 100 mL of petroleum ether.

8.12 Rotovap to remove petroleum ether, make up to a suitable volume for GLC analysis (10. mL allows a lower limit of 0.002 ug/g).